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THE PRACTICAL TEACHER

Well-known Teachers at Work:
Mr. R. BUNTING

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OF THE
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THE

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A MONTHLY MAGAZINE AND REVIEW

FOR THE SCHOOL-ROOM AND THE STUDY

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EDUCATION IN PARLIAMENT.

HUNGER and ham—the unfed scholar and the East Ham revolt—have been the chief topics of a Senate bent on educational discussion of late. Hunger is a subject appropriate during Lent—but ham? Easter brought to Westminster an interval of blessed silence, when even ham and eggs could not be debated; but Easter all too quickly went past. Members gathered again, the lobby filled up, May came in with lamb, and the sauce of mint, and still the talk was of ham, ham, ham; East Ham and West Ham, the refusal of proud Councils to carry out an Education Act, and the need to bring Ministers down upon their hams. "A hamstrung Act!" said the Opposition journals; and the House looked hourly for a procession of out-of-work teachers arriving from the eastward parts of the great mass and congeries of streets and houses that lies athwart the Thames. Squadrons of determined East Saxon schoolmistresses, led by the Boadicean Mrs. Burgwin!—cadet corps of British and National pupil-teachers!—regiments of stalwart Provided schoolmasters, commanded by the resolute and Provident Mr. Blackburn! Storm rose, whirled, passed, and out of it emerged on a Thursday the figure of the member for North-west Ham, Mr. Gray.

Let us notice how catching the talk of hunger can be, and beware. It all began with the dithyrambs about the underfed school child. Just before Easter, one night at nine o'clock, Mr. Bamford Slack, from Hertfordshire, rose up to speak about the starving scholars of Essex and Middlesex. "Feed them!" he cried; "let the local education authorities feed the starving young committed to their care!" "By all means!" said a generous and all but weeping House of Commons. "Out of the rates, the Poor rate, the Education rate, *any* rate; but at any rate let them be fed!" Then the East Ham Borough Council put a placard on its breast. "*We* are starving also," the placard read, in bold black letters. "Feed *us*, the Mayor and Corporation of the newly incorporated Borough of East Ham! Grant us some special grant! *We* are underfed!" A chorus of "Hear, hear!" came from West Ham, led by Mr. Gray, the fugleman. "Feed the lambs, but also feed the Hams! For if you don't——" Dire threats, revolts, martyrdoms, active resistance, schools shut and shuttered, children guttered, teachers crowding the ranks of the unemployed! Thus dangerous is it for sciolists to interfere, with meddling fingers, in the great slow machinery of social evolution, by which a world of individuals slowly rights and betters itself. You start a reform in the feeding of children, and down upon you comes an avalanche of Hams!

"That, in the opinion of this House, Local Education Authorities should be empowered (as unanimously recommended by the Inter-Departmental Committee on Physical Deterioration, 1904) to make provision, under such regulations and conditions as they may decide, for ensuring that all the children at any public elementary school in their area shall receive proper nourishment before being subjected to mental or physical instruction, and for recovering the cost, where expedient, from the parents or guardians." That was the resolution which Mr. Slack put before a sniffing House of Commons; brimstone and treacle again—a very large basin of it indeed, they thought. Slowly the after-dinner House of Commons gathered that here in concrete shape before them, as a Resolution upon which they must vote aye or no, was the monstrous, un-English, Socialistic, never-till-then-heard-of proposition, that you should feed a child before you teach him, and that little empty bellies are perhaps even less patriotic than empty heads.

A fair sprinkling of empty heads can be found in the House of Commons, and a few people there know by past experience what emptiness in the other part of the anatomy means. There were stirrings in a third part, the heart; and also in that mysterious part where conscience dwells. A sense of new duty, "stern daughter of the Voice of God," awoke in the

august Assembly; if but a little child from the East End, weary, ragged, and hungry, had peeped in and faltered up to the Bar, the House must have wept. Even the worst that stern moralist and economist, Bartley—long associated with savings banks and popular thrift—could bring himself to do was to propose that the relief to the starvelings should be defrayed out of the Poor rate. But Dr. Macnamara would have none of that; it would pauperise the parent. He would punish the parent, indeed he would "scarify" him; but he wouldn't pauperise him—oh, no! The two baronets, Sir George Bartley and Sir George Banbury (of Peckham) were a kind of Rip Van Winkles, he said. He (of Camberwell) wanted to care not only for the Arab of Kordovan, but the Arab of the New Cut. Old John of Gorst, time-honoured Cockertonizer, followed in a maladroit vein. He wanted "the medical profession let into the schools." In his mind's eye he saw poor Jo less taught than fed and doctored. A shudder ran through the House of Commons, which considers that Camberwell has doctored it too much of late, with brimstone and treacle and words; and enthusiasm began to wane. Sir William Anson doctored the House still further. The visit to Johanna Street schools was all wrong, the real facts and figures belied the assertions of the Parliamentary visitors. Nevertheless, something efficient should be done. The Guardians of the Poor should do it. The Guardians of the Poor should be circularised. Also the Education Committees. Yes, certainly they should. Then twelve o'clock struck, the House divided ineffectively, and the debate was "hung up" to dry.

Not much, apparently: an intolerable deal of sack to mighty little bread. But mark the consequence: circulars have actually gone out—the Local Authorities may take it or leave it—and the Central Authorities, free from brimstone and treacle a while, can enjoy the folding of the hands to slumber. That is to say, the Local Government Board can, for the Board of Education cannot: Wales buzzes, and East Ham rises revolting, majestic in its wrath. "If we are to feed the unfed as well as school them," cries East Ham, "we should just like to know where the money's to come from, that's all! We can't do it—we can't afford it—we won't even school the young rascals any more." "Bring me ewer and basin—bring me a towel and soap; I will wash my hands of Education Acts," says the Mayor of East Ham, Pilate-like, in the Municipal Hall of Judgment. And the member for North-west Ham rises to move the adjournment of the House. Here's a how-do-you-do! Here's a pretty mess! East Ham schools are to become the abomination of desolation—what is the Government going to do? "The reign of Chaos and old night"—"black Chaos comes again." *The* Education question is not the feeding of school children any longer, it is the question of school rates. Before the great public duty of not causing a shop-keeper, tied-house owner, or cottage-property investor to pay another shilling a year more on rates, everything else must bow. The schools are to be closed. Education ceases,—

> "Religion, blushing, veils her sacred fires,
> And unawares Morality expires,
> Nor public flame nor private dares to shine,
> Nor human spark is left, nor glimpse divine;
> East Ham, great Anarch, lets the curtain fall,
> And universal darkness buries all!"

BRITISH MUSEUM

Rates, local rates, and a Jack Cade of an East Ham Council, *that* is the Education question now. The House of Commons, true to its electioneering and head-counting instincts, never stops to inquire if the school-rate *is* so great a burden after all. For non-purely parochial purposes East Ham raises rates to the amount of five and fivepence in the pound. An East Hamite who can afford to live in a house or shop rated at £40 a year pays rather less than £6 a year to the common borough fund for expenditure on elementary education—2s. 10d. in the pound; and 2d. in the pound for education other than elementary. A humbler householder, assessed at £20, is in revolt because he must pay £3 a year in school rates. Thus is displayed the tender and invincible attachment of the Englishman to religious and moral education! Who revolts because £3 a year is spent on beer, or £6 a year on "Scotch" and cigars? But beer, "Scotch," and cigars are necessities of life, of course, and schools are not. Money cannot be saved on beer, "Scotch," and cigars, but it can on schools. So something like a thousand teachers and other school officials in East Ham receive notice to quit their blameless and beneficent toil.

That was the problem before the House of Commons, and how did the Prime Minister treat it? "You have been extravagant!" the Premier of the wealthiest land in Christendom told the East Ham administrators; addressing them vicariously, of course, because their summoning to the Bar of Parliament in sackcloth and ashes is not yet. "You have spent too much money on bricks and mortar, your schools are too comely, you have whitened the outsides of your sepulchres too much!" Cold comfort for Mr. Gray. Dr. Macnamara severely chaffs him, Mr. Ellis Griffith taunts him with supporting in Essex the resistance to the Education Act which he had denounced for Wales. Small hope from the Prime Minister. "Rescind your resolution!" says the Prime Minister, stern, courageous, flint-like, adherent to the high, legal, and patriotic course, as always. "No alms to a sturdy beggar who threatens while he begs. Rescind your resolution, and then we will see." He is fumbling in his pocket for a ha'penny all the while. The House of Commons catches the spirit of its Draconian leader, and (with admirable self-sacrifice and abnegation) refuses to adjourn and hie to bed. But the clock adjourns it all the same.

That clock—the House of Commons clock! What does it think of all these proceedings—the contrast between the hot fit in the Hungry Children debate, and the cold shiver in the East Ham debate—all the fuss, vacillation, pother, and pretence, shouting self-advertisement, and hollow antics played in the name of Education on the green benches and the floor of the Commons House of Parliament, which it views from day to day with Sphinx-like face? But the clock has moments of self-betrayal. Having watched that clock for many days from the Press Gallery, the present writer is prepared to avouch, swear, make affidavit, sign and seal, that he has distinctly perceived the clock of the House of Commons to wink during "Education" debates. Also, that he has seen it put its short hand to its nose in a gesture vulgar and unworthy of a clock in so high and responsible a position, but pardonable, perhaps, in an instrument so sadly bored, experienced, disillusionised, and tried. The clock of the House of Commons doesn't talk about doing its duty, but does it. Honest old clock—talkative frauds of members! Some day, perhaps, when the

world has grown very old indeed, and the millennium is coming up hand over hand, just behind the other side of the horizon, the clock in the House of Commons will (slowly and reluctantly) tick away the golden moments of a debate on education during an "Education" debate. Is it for such stuff as hungry children and angry ratepayers that Scotland must wait her Act and lose it again? The Education Bill for Scotland has got its second Second Reading at last, but the clock smiles sardonically at the future prospects of the Bill; the clock knows Sir Charles Renshaw, and knows the House of Commons. "Time is of the essence of the contract," and the clock knows the insidious flight of the anything but "rosy hours." Oh, clock of the House of Commons, tick well! Tick out the old, tick in the new; tick out the false, tick in the true. "So teach us to number our days, that we may apply our hearts unto wisdom."

BY MANY HANDS.

"Quot homines, tot sententiæ."

N.U.T. NOTES.

APRIL'S closing days beheld the spectacle of perhaps four thousand teachers and their friends journeying towards Llandudno—that "Queen of North Wales" about which so much has already been written in the pages of *The Practical Teacher*. In my hotel, I heard that nearly three thousand of the special coupons issued by the Secretary of the N.U.T. had passed through the railway clearing-house, which fact alone bears witness to the accession of business to all the railway companies, and especially to the London and North-Western, whose efforts to make every traveller comfortable were generally and gratefully recognised. The lengthy account of Mr. Tom John furnished in the April number of this journal renders any extended notice of this year's President unnecessary. It was delightful, however, to hear at the Public Reception of Conference how well known and widely respected the Rhondda gentleman is from end to end of the Principality. Peers of the realm, M.P.'s, H.M.I.'s, Members of Education Committees, the Welsh Central Board, and the University Court of Wales all testified, unhesitatingly, to the great services Mr. John had rendered to education and his country, and he was inducted into the presidential chair midst a scene of the utmost enthusiasm. His address—delivered, by the way, to a somewhat smaller audience than is customary—was a clear and statesmanlike pronouncement, dealing mainly with the religious difficulty and the situation in Wales; and although the responsibility for the opinions he expressed must remain his own, I am satisfied that members of the Union everywhere will be ready to endorse them. As a Chairman I had better say at once, he disappointed me somewhat. I had hoped that the reserve of strength which almost providentially comes to the help and assistance of each successive President would have fallen to his lot. Somehow, it didn't: and after the early skirmishes over the standing orders, I felt a little anxious should Conference develop an unpleasant temper. No body that I know is so intensely loyal to its Chairman as the N.U.T. Conference, and in the battle of wits 'twixt the Chair and the heckler the sympathies of the floor are ever with the President. (I speak from experience in this matter.) But he must convince the concourse of his strength as well as his fairness, and I am not quite sure that Mr. John ever succeeded in this. He was too ready to get round his difficulties with a *jeu d'esprit*, and occasionally I could not help thinking his jokes were of the "cheap" order—a little unworthy of his distinguished position. From the beginning of the week to its close he worked most strenuously for the success of the Conference, and a generous crowd, forgetful of his idiosyncrasies, cheered him again and again when he rose to acknowledge a vote of thanks "for his able conduct in the chair."

The President of the Union.

THE success of Mr. T. P. Sykes was hailed with delight by his countless friends and admirers from all parts of the country. Although I prognosticated this result, I confess that the size of the majority exceeded my anticipations. Mr. Pickles was so good a second that his victory next year is a foregone conclusion; but apart from being the "runner-up," the Burnley gentleman was one of the heroes of the week, his magnificent speeches, bristling with point and epigram and superbly delivered, adding to the number of his adherents every hour. Mr. Blackburn polled fewer votes this year than last—a fact probably explained through the voter looking at the exterior and not at the heart; for the West Ham candidate possesses ability, energy, and an amount of courage and grit sufficient for three ordinary Presidents. I hope he will continue to persevere. The defeat of Messrs. E. R. Phillips, Cosnett, Gale, and Crook at the Executive election is greatly to be deplored, and is, in my opinion, the result of a vicious system for which I have never ceased to express my abhorrence. Each of these gentlemen is capable, each has rendered excellent service at Russell Square, each would indubitably be elected were the appeal to the country as a whole; yet each is squeezed out through the system of district representation. The case of Mr. E. R. Phillips, who polled 5514 in the V.-P. election, is particularly distressing, this being the second time he has been rejected by the South London electoral district. *Hinc illæ lachyrmæ!*

THE Llandudno Conference was notable in this respect. No suspension of the standing orders was moved to consider any matters not on the arranged agenda for the public sessions. Consequently, Salaries of Teachers, Examination of Scholars, a National System of Education, and the Feeding of Hungry Children were all discussed at great length, and, in the case of the first three topics, the ancient resolutions of previous Conferences were re-affirmed. The Feeding of Hungry Children debate was initiated by Dr. Macnamara, M.P., in a brilliant speech, who was ably seconded by Mr. W. Shawcross, B.A., a gentleman who is fast developing into one of the best debaters on the Executive. Mr.

Business Done.

C. T. Breary, a Hackney stalwart, strove valiantly to amend the Executive's motion, by throwing the cost on the Boards of Guardians throughout the country, and so well was he supported that all the eloquence and personal force of the member for North Camberwell were required to defeat the amendment. A division showed that 15,901 votes were cast for Mr. Breary and 21,874 against him; but as this result was not ready until after the close of the last public session, the main question was not submitted to Conference. The third public session was ushered in by a remarkably able address from Mr. Tudor Walters, the President of the Association of Education Committees, which occupied some forty minutes in delivery and might acceptably have been much longer. He was considerably interrupted by the continuous arrivals of hundreds of late comers, and as I listened to his fine educational utterances I thought, "What a pity it is that Mr. Walters has not been asked to speak at a fixed time—say 11 o'clock." Another year we shall doubtless make better arrangements for the comfort of a distinguished visitor. All the same, his very presence was evidence of a growing *rapprochement* betwixt employers and employed, which gives the most abundant cause for satisfaction to every lover of education.

THE only suspension of standing orders moved and accepted allowed the President to introduce a motion, asking the Conference to empower the Executive to recognise the valuable services rendered by Mr. J. F. Blacker as a member of the Executive and Officer of the Union. Conference readily agreed, and wisely limited the amount for providing a suitable souvenir to £25. The discussion on the Union's financial statements was eminently reasonable in tone, and a welcome contrast to the acrimonious wrangles that have characterised so many previous "private sessions." Mr. A. E. Cook, who always has "a day out" when balance-sheets are under consideration, strove strenuously to make Conference express the opinion that the Examinations Board should be self-supporting, and that the Executive should devise a scheme "for reducing the net cost of this account to the funds of the Union." After a spirited defence of the expenditure from the Chairman of the Examinations Board, a timely moment's intervention by Mr. Waddington saved the situation, and Mr. Cook's proposal was rejected by an overwhelming majority. Conference seemed a little ungracious in refusing a hearing to Mr. Pritchard, who claimed the indulgence of the representatives for a minute or two in order to move a vote of thanks to all who had assisted to carry on the various branches of the Union's work during the past year; and I hope that the Executive will omit the motion next year. "Superannuation" was the *pièce de resistance* of the domestic business, but beyond a declaration in favour of preferential treatment in any amending Act for teachers in actual service before the passing of the 1898 Act, nothing tangible was agreed to.

Private Sessions.

THE deliberations of no conference would seem to be complete without some attempt being made to modify the scheme of electing the Executive. This year a proposal was introduced to the effect that in all future elections to the Executive, the President, the Vice-President, and Ex-Presidents shall be considered as members of the Executive for their respective areas, and that the members to be elected in those areas be reduced proportionately. It was claimed that under this arrangement the Executive, which now numbers exactly half a hundred, would at the end of five years be reduced numerically by five, and that there would thus be a considerable reduction of travelling expenses: and it was further stated that, if some such rule had been in operation in the past, the invaluable services of Messrs. Waddington and Wild would not have been lost to the Executive. Although there was a difference of opinion, the vast majority of the Conference favoured the innovation, which begins to be operative next year. Outside the hall I heard some rash speaking regarding the possible "injustice" to Lancashire, and one excited individual went so far as to say Lancashire would leave Mr. Pickles "to the country" in 1906. Lancashire, of course, has too much sense to tolerate this kind of nonsense, and I shall expect to see him improve even on his magnificent poll of 3397 when the "books are opened" at Scarborough.

Election of the Executive.

THE local arrangements were admirable in every way, and reflected the greatest credit on the little band whose year's labours had culminated so successfully. Such of the functions as I was able to attend were enjoyable in the extreme, though I was not quite convinced that a Conversazione was the best substitute for the Conference Dinner. Amongst the younger men, Messrs. Goldstone and Shawcross seemed to add most to their reputations, whilst the thanks to the retiring President, Mr. George Sharples, were voiced inimitably by Messrs. Pickles and Caudle. The contrast between the two speakers was complete. Each in his own way was perfect, and I know not which the Conference enjoyed the more—the excellent, polished diction of Mr. Pickles or the quiet, quaint, delightful humour of the Reading gentleman, who always speaks well, and doesn't speak half enough. "On the floor" there appeared less desire to ascend the tribune than usual, and possibly this explains the delusion of the Conference neophyte who talked good-naturedly about the Executive's "oratorical field-day." My last word is of felicitation to both Scarborough and the Union, in that, a year hence, we are to be the honoured guests of one of the most beautiful and hospitable of Yorkshire towns.

A. C.

Reflections.

REGULATIONS FOR SECONDARY SCHOOLS.

THE revised regulations of the Board of Education have now been issued, and are in the main on the same lines as those of last year. The regulations extend for another year the permission accorded last year to schools which have hitherto been in receipt of grants to Science and Art Day Classes to continue to receive such grants, although they have not been able to qualify for full recognition as Secondary Schools, if they can show reasonable prospect of being able to qualify for full recognition as Secondary Schools, or as

schools of a new type that are foreshadowed. As no details are given we cannot criticise the proposed class of schools, but we read that provisions for the development and better organisation of schools giving "an education of a kind higher than, or different from, that given in ordinary Public Elementary Schools, but not extending to the age of sixteen, are engaging the serious attention of the Board. We know some of those schools, and we earnestly hope that public money will not be expended on schools which give neither a good elementary nor a good secondary education, but which owe their existence purely to class prejudices.

The regulations point out that it is possible for the Local Authorities to be too lavish in the matter of scholarships, and state that in some cases the sanction of the Board has been sought to Local Scholarships being held at schools where no efficient education of secondary type is given. In other cases, Local Authorities have mortgaged their Higher Education Fund to maintenance of scholarships on a scale which seriously hampers them in the work of providing and maintaining at a proper standard of efficiency that Secondary School provision, without which the scholarships are more or less useless.

The time required to be set apart for the group, including Mathematics and Physical Science, has been reduced from last year's minimum of seven and a half hours, including not less than three for science, to seven, including not less than two for science. In other respects the hours remain as before. In the case of a girls' school which does not meet regularly every afternoon, the Board may relax the number of hours required, provided it is satisfied that adequate provision is made for instruction in each of the compulsory subjects.

At the same time the Board seems to discourage the tendency to crowd all the school work into a long and heavy morning session, and points out that such a practice "may lead to overpressure of a particularly dangerous kind, either by lengthening the morning meeting unduly, or by trying to do too much in it," and "it is very doubtful whether in any circumstances a school meeting lasting longer than three hours is desirable, or even ultimately economical."

The prefatory memorandum points out that the rule of par. 21 should preclude the head master from having a joint control over both departments in cases where a Secondary School has been organised in premises which are also those of a Public Elementary School. "In order to be fully efficient, a Secondary School should be self-contained, as regards both staff and premises." The Board will not at present insist in all cases that the duties of the head master shall be entirely confined to the Secondary School, but "in the event of a vacancy occurring in the head mastership a separate organisation will, as a rule, be required." Presumably a similar interpretation will be given in the case of a pupil-teacher centre which may be attached to a Secondary School, which will bring us to the logical conclusion that if pupil-teachers are sent to Secondary Schools at all, they should be treated in every way as pupils of the school, and not as members of a quasi-distinct body.

Finally, the Board of Education has made an arrangement with the Treasury by which schools already in receipt of grants, and which are certified as being conducted in accordance with the regulations, will receive during the session an advance payment on account, amounting ordinarily to one half of the grant received for the previous session.

LLANDUDNO CONFERENCE.

OUR REPRESENTATIVE AMONG THE BOOKSTALLS.

YEAR by year the Publishers' Exhibition held in connection with the N.U.T. Conference grows in both size and importance; and year by year the representatives evince a stronger desire to examine and taste the wares submitted for their instruction and delectation by the leading publishing firms of the United Kingdom. Members of Education Committees—chaperoned frequently by responsible officials—are to be found amongst the busy throng; and I have no hesitation in stating, first, that no better exhibition has been seen than that at Llandudno; and, secondly, that in no previous year have so many teachers, officials, and others interested in education spent so much time in investigating the contents of the numerous stalls. With recollections of the magnificent fashion in which the Portsmouth Exhibition was housed fresh in my memory, the cellar-like habitation provided at Llandudno, with its narrow passages, concrete floor, and musty, vault-like smell, at first struck me unfavourably; but the unpleasant sensation wore off as I progressed, and by the end of the week I had forgotten the discomforts in the delight and satisfaction of the superb show.

The well-known firm of E. J. Arnold & Son (Leeds), had a splendid exhibit, remarkable alike for its quality and variety. Pictures were a prominent feature in its display, six new "A.L. History Pictures" published during the past year attracting special notice. Realistic models were there to charm the heart of every infants' teacher, and, amongst these, a fine railway station with trucks, signals, goods and passenger trains, took my eye. A capital series of Relief Model Maps, about twenty in all, were on view, and, naturally enough, the country of Wales had a leading place. A novelty was this firm's "Year Round" Nature Pictures for composition, of which there are twelve for each month, or 144 in all. They are gummed and perforated, the idea being that each child should have one to stick at the head of his paper as the subject of an essay. Bell & Sons made a feature of their York Readers for infants and the lower standards (1 and 2). Besides some delightful coloured illustrations the books contain carefully graduated exercises in word-building, and—at the end—a number of memory drawings, white on black, which are quite novel. *Webster's International Dictionary* (price £2, 3s. 6d. net) with its patent marginal index, is complete enough to render cyclopædias almost unnecessary. Other striking exhibits by this firm were their secondary schools' books and their Fitzroy Pictures: Seasons, Months, Work, and Play. Blackwood & Sons showed Literature Readers, English Classics, George Eliot Readers, and Simple Civil Service Copy Books. In addition to prize books, there was a fine series of modern English writers, and one of the books to catch my eye was Mrs. Thurston's

striking romance, *John Chilcote, M.P.* BACON & Co. exhibited Nature Drawing Charts (which are published also in card form), Brush Work and Design by Frank Steeley, an excellent series of "Letterings," and a wonderful variety of useful maps. Their "Soft Grey Lines"—25 in each stage—were very attractive to all lovers of art, whilst their *threepenny* atlases were a marvel of cheapness and finish.

The display of BLACKIE & SONS was notable, even in the midst of its excellent surroundings. A quite new set of "Model" Readers for all standards is likely to be popular in schools, the books being beautifully printed, well illustrated, both in colour and black and white, and containing an appendix of six songs in both notations to relieve the occasional heaviness of school work. Their course of practical freehand and brush-work drawing (arranged by J. W. Topham Vinall, London County Council Specialist) is a valuable one, whilst their portfolio of plates and drawings ought to be in every senior school. Their "Red Letter" Library of English Classics is one that every book-lover should yearn to possess, being dainty in the extreme besides exceedingly well chosen. Their School and Home Library is too well known to need an extended reference. W. & R. CHAMBERS had also an excellent display, worthy of this firm's great reputation. The *Cyclopædia of English Literature* (now published in three volumes), *Twentieth Century Dictionary* (extraordinarily cheap at 2s. 6d.), and shilling *Etymological Dictionary* attracted my attention at once. Their Twentieth Century Geographical Readers — not yet quite complete — are amongst the best of their kind, whilst their *Stories from British History*, in three books, provide a desideratum which many teachers have anxiously awaited a long time. Object-lesson Sheets—three sets each containing 21 diagrams—seemed cheap at 12s. 6d. a set, and likely to be useful anywhere. Prize books also were greatly in evidence. CASSELL & Co. showed their favourite "Eyes and No Eyes" series, in six books, and a delightful "Fairy Tales" series in five volumes, to which the ever popular Andersen and Grimm had largely contributed. Two topical works were *Japan —the Eastern Wonderland* (D. C. Angus), and *Russia —the Land of the Great White Czar* (E. C. Phillips and Mrs. Horace B. Lode), *Treasure Island* as a supplementary reader for upper classes represents the *ne plus ultra* of attractiveness for both boys and girls. J. CURWEN & SONS displayed their most recent musical publications, including Sight-Readers in both Notations (sets of six), Collections of Songs in both Notations, National Songs (arranged by W. H. Harlow, Fellow of Worcester College, Oxford), whilst there was an abundance of up-to-date Charts, &c.

CHARLES & DIBLE exhibited practically every requisite for infants' and junior schools, and I was struck with their *Nature Reader Monthly*, of which the April number (by F. H. Shoosmith, B.Sc.) was just issued. "Alcohol and Life" seemed to meet the newest fad. "Mass" Drawing, a rational course of Brush-work designed to meet the requirements of both Nature Study and Hand and Eye Training, should go well. Their Modern Composition Exercise Book, with pictures printed at the head of each page, is a pleasant variation on the interminable essay. The CAMBRIDGE UNIVERSITY PRESS had on view a fine collection of Mathematical, Historical, and Educational works, in addition to its renowned classical series. A school edition of Scott's works pleased me vastly. CHAPMAN AND HALL'S stall was a veritable *fête des yeux*, containing, as it did, superb reproductions of the world's artistic masterpieces. This firm's "Elson" pictures are just the thing for school decoration. They are carbon photographs of imperial large size, and the series contains *chef-d'œuvres* of both old masters and sculptors. To be able to secure reproductions of the Venus de Milo or the Laocoon for twenty shillings is no light thing. Plaster-casts for advanced art-work, science text-books, and brush-work manuals were also shown, whilst some "Natural Feather" Studies, four series in sets of twelve, price 18s., were new to me. DEAN AND SON showed the rag and other Toy-Books which have made this firm so deservedly famous. These are printed in colours, can be washed over and over again, and a very practical test of the durability of the colours was before the gaze of the passer-by. In these days of "tariff reform" it was interesting to learn that this firm's goods are British productions from end to end, and that in spite of the tariff a large trade is done with the United States.

Prominent amongst the musical exhibitors were the EDUCATIONAL MUSICAL INSTRUMENT Co., which showed several high-class pianos and organs. An overstrung piano (by Morton Bros. & Co.) seemed a very fine instrument indeed for £36, containing, as it did, all the latest improvements, including inter-damper-check-action, celeste pedal, and ivory keys. A piano of artistic appearance, described as of "Sheraton" model (price £28), was claimed to be "fashionable" in style. Certainly its tone and touch left nothing to be desired. There was a useful piano for home use at £18, and also a "School" piano in solid American walnut for £20, which I was assured had already been supplied to hundreds of educational authorities. This latter is specially strongly constructed for hard wear. GINN AND Co. showed the American Nature Books, which never fail to charm all into whose hands they fall. A delightful series comprised—1. *Toward the Rising Sun;* 2. *Northern Europe;* 3. *Under Sunny Skies;* 4. *Wide World;* 5. *Strange Lands near Home;* and all will interest the children and instil in them a love of reading. Prof. Conn's *Bacteria, Yeasts and Moulds in the House*, Prof. Jas. Harvey Robinson's *History of Western Europe*, and Chas. D. Shaw's *Stories of the Ancient Greeks* were amongst the newest of this firm's excellent publications. HARDMUTH & Co. displayed a large case of Exhibition Medals, all bearing testimony to the excellence of the firm's goods. Koh-i-noor Pencils were naturally much in evidence, as were also Waterman's "Ideal" Fountain Pens, which are doubtless all that is claimed for them. (*Par parenthèse*, a "Swan" is good enough for me.) Some sketches, drawn with the firm's Black Chalk Pencils, showed what can be done when these are properly used. W. & A. K. JOHNSTON exhibited the maps for which they are renowned, including a useful Simplex Wall Atlas. They showed also Botany Sheets for Beginners, a capital set of Diagrams referring to Hygiene, and a number of object-lesson pictures. "The Sick Children's Hospital" carries its own story and moral lesson.

T. C. & E. C. JACK showed a variety of dainty books, suitable for prizes, as well as all their latest publications, including *Motors and Motoring*, a children's *Pickwick* (with coloured illustrations), Scott (extracts), and a capital language manual, *French by the Direct Method*, arranged by Mr. T. Cartwright from the work of Rossman Schmidt. Its excellences

have already secured its introduction to Marlborough College, University School, and many other famous public and secondary schools. LONGMANS, GREEN & Co. gave prominence to their new "Empire" Readers, a series of seven, whose admirable selections are calculated to encourage a love of reading. Conan Doyle, Haggard, Kipling, Marryat, Ballantyne, Tennyson, Dickens, Thackeray, R. L. Stevenson, are a few of the authors called on to delight and instruct the youngsters. This firm's famous "Pictorial" Geographical Readers have the advantage of being *reading* rather than text-books, their easy descriptive lessons commending them to juvenile minds. Supplementary Readers, comprising Fairy Tales and Romance Tales (Andrew Lang), were also shown. HORACE MARSHALL AND Co. had on view their well-known "Temple" Readers, as well as an admirable Series of History Readers, edited by C. L. Thomson. Miss Thomson's "Romance" Readers—*Tales from the Greek*, *Children of Odin*, &c., are quite delightful, and revelled in when they are available. "Carmelite" classics included Milton, Gray, Goldsmith, and six others, and appeared cheap at from 3d. to 6d. per volume.

MACMILLAN & Co.'s exhibit maintained the excellence of the productions of this famous publishing firm, amongst their newest work being the "New Globe" Literary Readers (standards to lead up from infants'), Continuous Readers, and "Globe" Poetry Readers, suitable for all standards. These popular poetical readers are published in four parts—junior, intermediate, senior, and advanced. "Picture" Arithmetics, in three parts, for junior classes, are absolutely new, whilst Murche's Nature Knowledge, and new History Readers on the concentric plan, correlated with Geography, all must command a large sale. METHUEN & Co. showed the latest volumes of their marvellously cheap "Standard" Library, as well as a number of scientific works suitable for secondary and higher elementary schools. Their little works on Art, at 2s. 6d. net, deal with Burne-Jones, Leighton, Watts, and thirteen other eminent painters. The NORMAL CORRESPONDENCE COLLEGE exhibited a very fine work, *New Freehand Drawing* (Arthur Schofield, A.R.C.A.), price 3s. 6d. net, and a Shakespeare Series, required for a variety of Government examinations. Charts displaying the wonderful successes achieved by their pupils were naturally in evidence.

T. NELSON & SONS showed the Encyclopædia which, under the title "Harmsworth's," is selling everywhere so rapidly. The "World and its People" Series of Geographical Readers, the "Prince" and "Princess" Literature Readers (arranged by that eminent *littérateur*, Dr. Garnett), "Junior" Supplementary Readers, were some of the exhibits which appealed strongly to me. Wall-Atlases, Correlated Drawing and Brush Work, in five stages (by J. Vaughan), Diagrams of Plant-Life and Natural History, Infants' Reading Sheets, all proved the up-to-date character of Messrs. Nelson's productions. Their New Century Library of English Classics should suit every taste. G. PHILIP & SONS made a special display of their Comparative Series of Maps, showing elevations, &c., and atlases of every description. A new Physical Globe in colour was, I was informed, just issued, and likely to prove useful. Brush-work diagrams and materials were also shown, whilst their framed pictures, at from 7s. 6d. to a guinea, according to size, made me covetous of wealth. Raphael, Da Vinci, De la Roche, were amongst the great names I saw exhibited. REEVES & SON had on their stall some beautiful designs executed in the Burslem Schools, besides a variety of crayons, mathematical instruments, brushes, colour-tubes, pencils, rubbers—in fact, every conceivable requisite for art-teaching in schools. They showed also a solid-oak table demonstration board, able to fix at any angle, price £1. The UNIVERSITY TUTORIAL PRESS (W. B. Clive) displayed books on Mental and Moral Science, Roman and Greek History, Mathematics, Classics—a multitude of excellent publications designed to assist the thoughtful student.

Altogether, some seventy or eighty firms contributed to this finest of Publishers' Exhibitions, and I have dealt with perhaps half of them only. This account does not pretend to be exhaustive, but merely representative. It deals with books, &c., that I myself saw and handled; and it is quite possible that it may be remarkable for its omissions. However, I content myself with the knowledge that half an issue of *The Practical Teacher* would be required to describe *all* the good things there were to see, whilst the whole of Easter week would have been claimed for the purpose. These neither the Editor nor his contributor could spare.

NOTES FROM THE NORTH.

The Education Bill.

THE second reading of the Bill is now safely passed, but it cannot be said that it has yet reached calm water. The debate clearly showed that uncertainty still awaits its acceptance. We were much disappointed in seeing two questions, on which surely enough has been said and spoken, namely, that of the School Board area and that of amalgamation of Boards which divide among them urban areas, rear their heads once again. Another question that came in for considerable discussion during the second reading debate was the feeding of school children. The question, we venture to think, has not yet reached the stage at which it might be easy for Parliament to devise a working scheme, and such being so, it seems somewhat out of place to imperil the present Bill because of this question. Of course one of the provisions of the Bill, namely, the providing of medical inspection, logically leads up to the question of feeding. If medical inspection proves that the unfitness of a child to be educated arises from mal-nutrition, then it would appear as if something should be done for the child. But it seems to us that this question would best be solved by a separate measure. The tone of the discussion was on the whole friendly, and very few important differences of opinion seem to exist. As the result of some compromise between the opposing parties, it was agreed to take the Committee stage of the Bill in the whole House, and not in a Committee. This will, no doubt, cause some risk, and it may be that we shall not have the third reading until the dangerous "dog-days" arrive. However, we have strong hopes that the Government will successfully negotiate all difficulties, and that we shall have an Education Act in 1905.

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The Financial Aspect.

THERE were numerous deputations from Scotland at St. Stephen's with reference to the Scottish Education Bill; so numerous, in fact, as to form a menace to its passing. One of the points on which there is much divergence of opinion in certain quarters is the retention by the municipalities of the control of the Equiva-

lent Grant, £62,000 of which it is proposed in the Bill to hand over for educational purposes to the Education Department. Last year, it may be remembered, the Government proposed to take the whole of the Equivalent Grant—amounting to £162,000—and to put it to a general education fund. As a result of the fight by the municipalities on that occasion, the Government gave up £100,000, but proposed to appropriate the balance. It is contended by the deputations of the municipalities that such a course would not in any way promote the cause of education, seeing that the proposed educational authorities to be created under the Bill would have power to rate both for higher and technical, as well as for elementary, education within their several areas. Further, they maintain that it will disturb the arrangement made with the three countries, by which the Equivalent Grant was to go in relief of local police rates. Again, it is urged, that if the £62,000 of the Equivalent Grant is to go into a general educational fund, it will be relieving the owner ratepayers—police rates being only paid by occupiers—whereas the school rates are levied both on owners and occupiers. As to the Residue Grant, the municipal deputationists did not object to the Government taking the whole of that for educational purposes; but they would like to see the same plan adopted in Scotland as in England, namely, that it should be used for the purpose of higher and technical education, and for co-ordinating education in certain districts. The Government, if it were to give way on the Equivalent Grant, it is contended, would find the future of the Residue Grant made a matter of easy arrangement.

A COMMITTEE, consisting of members of the Edinburgh Merchant Company, the Leith Chamber of Commerce, and the Edinburgh Chamber of Commerce, have drawn up in detail a course of commercial education leading from an early stage to the end. The course will be given in George Watson's College. Commercial certificates will be awarded, not on crammed examinations, but on the general work of the classes, and the work will be supervised by a committee of merchants delegated for the purpose by commercial organisations. The committee is co-operating with the Education Department on the subject. The scheme may lead in time to the development of a commercial side in the University. This, with the assurance that the Government are contemplating the establishment of a Ministry of Commerce, may give an impetus to the promotion of sound commercial education in the country. It is well to realise that education is not synonymous with information, and the object of this course is to develop intelligent men as well as commercial machines. The headmaster of the College, Mr. John Alison, has recognised this, and it is expected that the scheme will pre-eminently tend to develop intelligence on commercial lines.

Commercial Education.

THE Ladies' Committee of the Educational Institute early in the session sent down a circular to the various branches on the question of the feeding of children. As a result they have received numerous more or less satisfactory replies. It is evident that in many districts much is already being done in the direction of feeding children, but nothing of a systematic nature at present exists. In many rural districts dinners are provided during the winter months, and in a few places free breakfasts for poor children have been provided. From one of the branches in the North it is recommended that School Boards should be empowered to provide a warm meal at mid-day for children attending rural schools who are necessarily from home for the greater part of the day. Those who have had experience of soup kitchens speak highly of the benefits in the physical well-being of pupils and improvement in school attendance during the winter months. There seems to be a very general idea that the regular feeding of school children should not be encouraged, as this would weaken parental responsibility. Some branches would welcome a clause in the Education Bill giving power to School Boards to incur expenditure for this purpose. As the result of the circular it would seem as if there were great difference of opinion, and, as we have said, the matter does not yet seem ripe for solution.

Feeding of Children.

IN many quarters great dissatisfaction has been expressed with regard to the present mode of electing the President. Various schemes for improvement have been suggested. The matter has been before various committees, and after remitting it back more than once the matter is not a bit further forward. The most recent proposal was to appoint a commission annually, consisting of the President and Vice-President, the ex-President and ex-Vice-President, the President-elect and the Vice-President elect, and the member of General Committee of Management who at the annual election secured the largest number of votes in the province. This was, however, unanimously negatived. It looks as if the members of the Institute, having once tasted the power of popular election, would not willingly relinquish that power. The present method may have disadvantages, but its disadvantages are not so great as its advantages. The best men will in the end be willing to allow themselves to go forward to election, and if the Presidentship be not combined with Congress, which in the past has been a very important and deciding factor, we feel certain that the present method of selection is as good as any.

Presidentship of Institute.

A MOTION of some importance was before the General Committee of the Institute at a recent meeting with regard to the appointment of Inspectors. In not a few influential quarters it is very freely expressed that too many of our Inspectors are too young. The motion read: "That in view of the establishment of a national system of education in Scotland, the Educational Institute of Scotland considers that practical experience in organising different kinds of schools and school-work should be an essential qualification of all Inspectors appointed by the Government, and that in order to give time to ensure such training in sound judgment, along with scholarship and skill in teaching, no one should receive such appointment who is under thirty-five years of age." There is much to be said for this in view of the fact that individual examinations have been abolished, and that inspections now are not so much to see what each pupil knows as to find out the lines along which a class

Inspectorships.

has been taught. How many of the Inspectors now appointed can give any practical assistance to the headmaster of a school, the practical working of which they know little? It would appear as if it were necessary more and more that our Inspectors should be men who have had an intimate and practical knowledge of classification and co-ordination, and who have themselves been successful teachers and organisers. Such men would at the present time—at this time of freedom of classification and curriculum—be of immense value in co-ordinating the various classes in a school, and the various schools in a district. The Education Department would do well in future appointments to make the experiment.

Publication of School Reports.

ANOTHER subject to which the attention of the Department must sooner or later be called in a stronger way than heretofore is the publication in local papers of school reports. These documents should be held as private communications between the Department and the School Board. How much harm is done by the advertising in the public press of the reports on schools it would be difficult to estimate! The pupils read them and the parents criticise them. Yet how many of the latter are able to estimate the difficulties one school may have to contend with as compared with its more highly fortunate neighbour. Their publication has to my mind no justification, and in many cases tends to cause bitter feelings in the minds of the ratepayers and the teachers. The Department, we believe, could assist very largely in this matter.

MY IMPRESSIONS OF LLANDUDNO CONFERENCE

IN the hope that the intrusion of an utterly impractical person in the columns of a practical journal will not be resented, I take up another fellow's fountain pen to record my impressions of Llandudno and the Conference week. This annual concentration of the brains of the nation is distinctly elevating to the mind—and very trying for the commissariat. Euston Station on the Saturday before Easter was like a beehive, with this difference—there was more buzz than work. The publishers' representatives, having more on their conscience than mere pedagogues, were early risers, and left by the 8.30 A.M. train. It is very hard for those who follow a highly intellectual occupation to be misunderstood, for a porter of the baser sort asked me where the match was to be played, as he gazed upon the gilded saloon as she tugged and strained at her anchor.

The Joy of a Guide.

Before I left London I had put into my hand a handsome volume entitled "Llandudno Conference Souvenir," a thing of beauty and a joy for ever—a new phrase which has just occurred to me. Greedily I turned over the pages of this tome (*see* "The Dream of Eugene Aram," ver. 6, line 1), and found to my unspeakable happiness that it was to all intents and purposes a guide-book. Some people exact their recreation from Encyclopediæ, but give me a guide-book. Nothing affords me greater joy than to be taken by the hand, so to speak, and be shown round a place on paper, by a man who knows more about it than anybody else has ever been able to discover. I packed that tome carefully into my bag first of all, with a reckless disregard of the possibility that it might crowd out my toothbrush, and a stick of special shaving-soap given to me by an American friend, who told me it would enable me to really enjoy my face. I was able to dip into the tome at intervals and derive therefrom much valuable information respecting this "paradise for pleasure seekers" (*see* guide). At the outset, however, I began to lose faith in the author. I know a lot of authors, and perhaps that had something to do with it; but the statement that "the town lies on the shore" is misleading. Of course the author knows more about Llandudno than I do, but in justice to the town I must say it was not lying on the shore when I was there. It was standing up, and well back from the shore. I am utterly indifferent to what local guides tell me about *mean* temperature, as I dislike anything mean; besides, the temperature of Llandudno struck me as being very generous for the time of year, though not so warm as Fleet Street, where exotics flourish all the year round. Easter week must have been quite a little change for the people of Llandudno, for the guide told us that "at Llandudno we have but little smoke." All I can say is that at several places I attended one could hardly see across the room for smoke. It is quite evident, however, that Llandudno under ordinary circumstances is a fine place for folks like the old Yorkshire lady who "enjoyed very poor health."

Strawberries in December.

It seems that whichever way the wind blows, it gets tired when it reaches Llandudno, and sits down on the top of Great Orme—as most of the visitors do. We were told that strawberries grown outside had been picked in Llandudno last December. No wonder they were not on tap at Easter—and this is hospitality. The Llandudno Town Improvement Association have arranged suitable scenery in the neighbourhood, and the local Coaching Company will take you to see it on the usual terms. Should the rain descend and the floods come, the coachman disclaims all responsibility, but if the sun shines, he assumes an air of absolute proprietorship, which is all very right and pleasing, as the man said when the motor-car ran over the income-tax collector.

These beauty spots of North Wales are very delightful, if you don't try to tell your friends where you've been. This undoes all the good you have received, and further, disarranges your cravat. If you've had a drive to Dwygyfylchi, don't mention it. Cut the word out of the coach bill, and paste it on your cuff—for reference. Let your friends say it if they like, but don't hurt *yourself*. And this brings me to the language. You *have* to be brought to the Welsh language—under escort. After a thorough investigation I find there is unfortunately nothing one can drink by which to acquire a correct Welsh accent. The suggestion that a course of Welsh Rarebit will be of any assistance may be dismissed as frivolous, and the deposit forfeited. There were some, however, who made attempts at Welsh during the Conference, but they are now laid up in dry dock for repairs. They had in their minds no doubt the words of the deceased poet who said—

"And how can man die better than facing fearful odds?"
—*See* Legend of one Horatius, the Bridge-keeper.

A Twist of Tongue.

It is sad to reflect that there are poets who are dead—and others who are not. Welsh is one of the few languages I cannot speak of filewellyntly. I abstain in self-defence. My system of language study is neither of use nor profit to a publisher, as I always converse with the oldest inhabitant, and avoid the latest text-books. I had a prejudice against text-books in my early youth, though I freely admit now, having seen some, that even publishers must eat, and therefore my early aversion was unfeeling, to say the least. I found the oldest inhabitant. He was lying on the shore, where, according to the guide-book, the town should have been. I begged of him not to rise on my account, but to continue lying—which he did. I presumed that his name was Jones, or Evans, or Parry, but he shook his head in Welsh, and said his name was—well, I didn't quite catch it, but it warped the landscape.

He said he was born in the parish of Llanfihangelesceifiog—but it didn't seem to hurt him much. I asked him if he knew Cadwaladr Morgan Ap Thomas, and he said he went to school with him at Llan—etcetera. In reply to a further question he said there "wass good fishing look you in the rivers and lakes as well as the sea. Indeed and to goodness one gentleman whateffer wass had his fish sent after him the other day by train it was so heffy." I gave him a liberal discount, and went back to the hotel to consult the guide-book, as I had never fished in a lake and was seeking new experiences. It was just as I feared. That fellow *had* been lying on the shore. The book said "lakes abounding in fish and jealously guarded by tall peaks." Now what on earth is the good of lakes full of fish if they are only used as padding for a guide-book, and what a quaint idea to call their policemen "tall peaks."

The Welsh "Mrs. Harris."

I heard a great deal about the Flora of Llandudno, but in spite of repeated inquiries was unable to trace this lady. None of the girls at the tea-shops or hotel dispensaries answered to that name, and it is my firm conviction that Flora of Llandudno is the North Welsh "Mrs. Harris," and I here flatly say that I do not believe there is any sich person, and I hereby tender my apologies to the large number of delegates who assisted me in my search.

It is the same old trick. I went out to Richmond one day to see the Lass of Richmond Hill. When I had climbed to the top I found scarcely anything else but lasses, and no distinguishing mark to show which was the lady referred to. This is disappointing to an ardent collector. What I say is this, any town which advertises a special girl like this has a right to produce her, instead of turning the subject to a mouldy old castle, or a local edition of the Domesday Book.

The Conference was a great success, a tremendous success—a "howling success." I could hear it as I sat on the pier beneath the pavilion smoking a cigar presented by another American friend who had been dumped in Llandudno. He said the cigar was something extra, and I found it so. Nobody intruded on the seat which I occupied, and a hardened old salt who passed by wiped saline tears from his eyes and gazed pensively upon the horizon. This is about the only thing you can gaze at for nothing at the seaside. You mustn't gaze at the rolling sea—that is an extra. Delegates took refuge from my cigar in the Publishers' Exhibition. I went in there myself. "Here," I said, "I shall see all things new." The Publishers were kept in a sort of tank—with the water drawn off, of course.

The Publishers Who Did.

Water will not be the ultimate fate of the publisher. A Scotchman tried to sell me a tile map, but I told him I did not study geography on the tiles. I pointed out further that the average student could cool his fevered brow on a smaller area, so he gave me an earthenware ash tray in which to rest my weary brain. Each stand was an island surrounded by delegates. I tried to make myself useful, and was able to direct a young lady who wanted to see a new sixpenny edition of Jane Austen's "Senseless Insensibility." She said she was not sure of the title, and I somehow don't think she was. There was a very pleasant gentleman who asked me if I was interested in Brush Work. I told him it was brush work which had driven me from home, and that anything reminiscent of painting or whitewashing awoke unpleasant memories. He fell back therefore on Professor von Breyntarer's "Quintessence of Logarithms" or something like that. I fell back also, and requested him not to do it again. The Natural History section was very realistic, varying from stuffed dogs to rag elephants. There was an air of romance about the stories told of these fabulous animals. I noticed "Baron Munchausen" on this stand. He seemed quite at home. All the gentlemen who represented those modern Crocuses or Cresuses or whatever it is, who disguise themselves as publishers, told me they had something new to show me, and I was getting quite interested in books and charts and models and whatnots, when my eye lighted upon—but there let us begin a new paragraph.

The Haunted Scribe.

I felt my hair bristling with horror. I could not believe my eyes. Had I come 236 miles for this? No, no! I must be dreaming. Yet there it was in great staring letters. I had had it to breakfast, lunch, and dinner for weeks, and had come down to Llandudno for an entire change. Ashen pale and trembling I approached a gentleman of Van Dyck beauty at the stand in question, who kindly supported me.

I pointed a trembling finger at the huge placard and gasped—

> "The horrid thing pursues my soul,
> It stands before me now."
> —*See* "The Dream of Eugene Aram,"
> verse 35, lines 3 and 4.

He placed a volume in my hand and my worst suspicions were confirmed. It *was* the *Harmsworth Encyclopædia*. The Van Dyck gentleman told me all about it, and I was too weak to resist. When I had recovered consciousness I fell back on a case of the New Century Library, and found peace.

There was a large oil painting hung at this stall. On investigation I found it represented a person of the name of Macnamara, who in addition to editing a paper, got into Parliament and played golf—so they hung him here. They said it was a speaking likeness, and it struck me as being out of place to have a ventriloquial entertainment at an educational exhibition.

On Tuesday evening there was an epidemic of dinners. Everybody dined with everybody else, and that touching refrain which has reference to some person being a jolly good fellow, was heard in the land of Llandudno. Even publishers dined.

It was their eighth annual dinner. It's a poor trade which only yields one annual dinner a year. Why, the London Chamber of Commerce has an annual dinner once a month, and the staff of *Punch* once a week.

The importance of this Conference may be imagined from the presence of publishers' editors. The *Editor Vulgaris* we all know, but the publishers' editor is a rare species which seldom descends to earth. Members of Parliament too (*Scholasticus Westminsterxrium*) were also exhibited. This is a fairly interesting species, but not so rare as the *Editor Publicatorum*. I explained this to my American friend, and he said it was extremely *quod erat demonstrandum*. T. H. S.

AT THE SIGN OF THE PAPER KNIFE.

BY J. EDWARD PARROTT, M.A., LL.D.

Vacation Sketches.

MISS DODDS[1] has written a very pleasant book, but one difficult of classification. It is not a novel, for the story is no more apparent than the costume of Venus—*il n'y en a pas;* it is not a travel-book, though there are many excellent descriptions of German and Hungarian scenery; it is not a problem-book, unless, mayhap, it strives to demonstrate (quite unnecessarily) the superiority of sovereign woman and the inferiority of subject man; it is not an educational treatise, though pedagogues and pedagogics are thick on the ground; it is not a philosophical work, though Nietzsche, Marcus Aurelius, Kant, Hegel, Plato, Schopenhauer, Aristotle, and Herbert Spencer figure on well-nigh every page. It is a blend of all these elements, with perhaps the educational flavour predominating. We suspect, and not without reason, that the vagrant Englishwoman, who has "composed a cookery-book, taken a laundry diploma, examined a school in needlework, and furnished a house," has more than a nodding acquaintance with Manchester students in training, and is not innocent of having also composed a work on Fairy Tales and Nature Study for the Infant School.

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Let me say at once that, despite her little affectations of superiority, the vagrant Englishwoman is very charming and very womanly, though she is addicted to the habit of epigram and succumbs to a passion for emending the Litany. One smiles—in the offensive masculine fashion, of course—at her rapid generalisations done up into neat little parcels, and one is amused at the heroic efforts she makes to teach man, a wofully dull scholar, his proper place in the world. What amazes me is that this delightful Englishwoman alone of the eligible ladies in the book (one of them actually refused the hands of nineteen noble gentlemen) manages to escape an offer of marriage, even though it should come from a shabby philosopher or a half-crazed poet. Frankly, I don't believe it. The chapter is missing—wilfully mislaid—in which the American with the "whimsical eyes" lays his heart, his broken leg, and his indefinite prospects at the feet of the vagrant with the pretty dresses, the sub-acid repartee, and the wondrous capacity for sympathy and friendship. I utterly discredit that "simple grave facing the sunset, marked only by a simple cross with the initials J. F. K." I refuse to be fobbed off with a funeral wreath instead of orange blossoms. Professor Priscilla, I know, preferred Applied Psychology to her blue-eyed Teuton; but our vagrant Englishwoman, I am convinced, had too much solid British common sense to sacrifice herself on a similar altar. But she has left the story "half untold," as Chaucer did that of Cambuscan.

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Miss Dodds lays her scene in a little German University town whither she has repaired "to give herself a little margin in life for growth—a resting time for thought." Here, at a boarding-house, we are introduced to a strangely assorted company. We meet the Cynic who swears at ladies and eats like a —— German; the Frau Dokter, the ideal of the Teutonic male, a past mistress of domestic arts, and awesomely reverential towards men-folks, of whose failings she is gloriously tolerant; the Boy, whose soul would be amply satisfied could he but sit among the pines at the Wilhelmshöhe drinking beer and singing student songs; the Poet, whose youth is his only excuse, and sundry others. The Cynic is openly derisive of woman and her sphere, and quite approves of the legend above the gates of the University—*Frauen, Kinder und Hunde sind streng verboten.*

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But the Englishwoman takes up the cudgels manfully and more than holds her own. Here are a few of her dicta. Men are "blind to their own blunders as well as to women's virtues, and blind, too, to the little important things that lie around them." . . . "Men are always straining dim eyes and looking into the year after next." They call this "considering the probabilities of the future," and all the time the women are attending to the wants of the present. . . . "Men are immaculate as the Saints in Heaven. They cannot do wrong. God made Eve so that Adam might have a woman upon whom to lay his sins, and men have gone on shifting the blame on to women's shoulders ever since. . . . The reason why men swear so much and women so little is merely one of vocabulary, for the former lack the fluency of speech which Providence has bestowed so liberally upon the latter; and so swearing was invented by men in order that they might not be entirely at a disadvantage in their quarrels with women." . . . "It is because men hate giving up their own way that they have invented the beautiful fiction about the womanliness of self-sacrifice; for not only do men insist that a woman must be self-sacrificing, but they insist also that she must like it."

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But the Englishwoman's life in the little town is not all sparring with detractors of her sex. She attends psychological lectures at the Lunatic Asylum, for the University rigidly excludes women, and here she meets teachers from many lands, all seeking inspiration at the fountain head. Now, everybody knows that educational theories which do not emanate from the Fatherland are mere shams and impostures. In education, Germany is the universal "dumper"; she not only gives us German bands and the Brodrick cap, but Herbart in the schoolroom. Her commerce in pedagogic ideas is endless, and it is time Mr. Chamberlain turned his attention to these importations which take the bread out of the mouths of honest British craftsmen. But to our muttons. In the lecture-room we meet Briton, Hungarian, Swede, American, and Jap, all taking copious notes; all eager to amass a

[1] "A Vagrant Englishwoman." By Catherine I. Dodds. Smith, Elder, 6s.

store of second-hand erudition wherewith to impress and baffle the good folks at home. "Special reporters" pay visits to the town, a mistress of a high school and a mistress of method bent on "finding out things on education in Germany and writing long reports about them which are afterwards published in blue books with yellow backs."

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At first sight this motley collection of weird professors, wool-gathering teachers, and half-fledged students living commonplace lives in a dull little town where nothing more exciting than a betrothal or a picnic ever takes place, would seem strangely unpromising material for an interesting book. Miss Dodds, however, has falsified expectations. She touches off her characters with skill and humour; she has a keen eye for foible and eccentricity; her dialogue is always pointed and never dull, and the result is an essentially pleasing book, which, though it may not win the favour of the circulating libraries, will certainly make friends amongst those who can appreciate honest literary workmanship and sympathetic observation of life at first hand.

T. J. MACNAMARA, LL.D., M.P.
From a recent portrait by Miss EVERETT.
(Exhibited at the Llandudno Conference.)

Tales out of School.[1]

Sheridan once observed of Lord Lauderdale, "A joke in his hands is no laughing matter." The same may be said of our educational journals, which as a rule only relapse into hilarity at rare intervals, coinciding for the most part with those festive seasons when "copy" runs short because everybody is at home minding his own affairs and not managing or muddling those of other people. This little book is the outcome of a relapse on the part of *The Schoolmaster*, which last Christmas stimulated teachers by the lust of gain to yield up for publication the juvenile jocosities of their lifelong experience. Out of this newly-acquired hoard and his own thesaurus amassed as teacher, member of the London School Board, and editor of *The Schoolmaster*, Dr. Macnamara has "made a book" on a race—the race of small human fry that frequents our elementary schools. In his prefatory note he thanks "his old friends, the teachers up and down the country, whose anecdotes he is presuming to put into print." They deserve it.

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In his general disquisition on the subject Dr. Macnamara admits that very many of the artlessly amusing things alleged to have been uttered by children are quite apocryphal, but in his collection he has endeavoured to separate the wheat from the tares, the spontaneous growth of the untilled field from the potted and tenderly reared seedling of the literary forcing-house. And very well he has succeeded, for most of the stories he purveys have the true ring about them.

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We should do this most entertaining little book a great disservice were we to gut its pages. It only costs a shilling, and there is a sovereign remedy in it for the "blues." Buy it by all means, and when you are entertaining your non-scholastic friends and conversation flags, read a page or two of it aloud. Your house will unquestionably become the most popular in the neighbourhood. Instead of quoting from Dr. Macnamara's laughable pages I prefer to recount two pieces of juvenile humour which, I fancy, are new to my readers—the first from the bosom of my own family, the second from a most entertaining article on "The After-Dinner Oratory of America" in the May number of the *Nineteenth Century*.

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Amy (loq.).—"We've had such a funny story from the Bible to-day about a lady who was dis-o-be-dient. They told her not to look behind, but she did, and what do you think? She turned into—pepper!"

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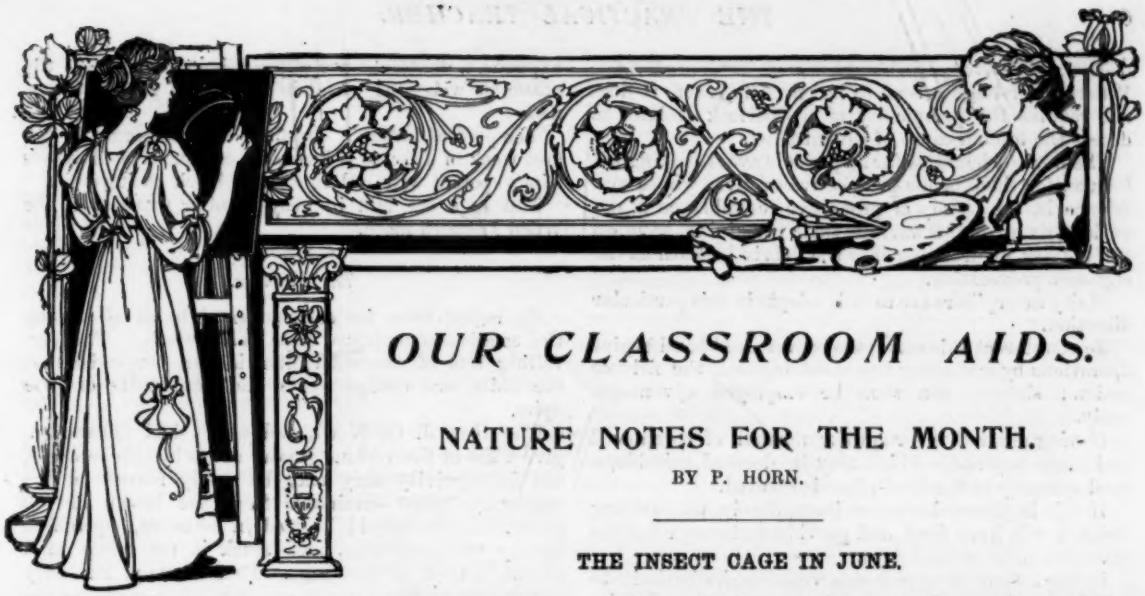
The clergyman was paying an afternoon call, and the lady of the house, pointing to her little boy, who bore the marks of a struggle, said, "Johnny has been a bad little boy to-day; he has been fighting and has got a black eye." "So I see," said the clergyman. "Come into the next room with me, Johnny, and I will pray with you." "You had better go home," replied Johnny, "and pray with your own little boy; *he has got two black eyes.*"

[1] "School-Room Humour." By Dr. Macnamara, M.P. Arrowsmith. 1s.



OUR CLASSROOM AIDS.

NATURE NOTES FOR THE MONTH.

BY P. HORN.

THE INSECT CAGE IN JUNE.

READERS who followed out the instructions given in March on the construction and maintenance of a breeding-cage, have, or should have gathered together quite an interesting and representative stock by this time. Lepidoptera in all stages of development, from the tiny larva eating its way through the egg-shell, to the glorious perfect insect, are now very plentiful, and rich indeed will be the reward of the collector who exploits the fields during the leafy month of June. The hedgerows in places fairly teem with life.

In the precincts of town, the amateur gardener has the fact forcibly demonstrated before him in a variety of ways. The leaves of the young lilac shoots show a mysterious tendency to curl and roll themselves into the form of cylinders, and numerous furry pests, ornate with paint-brush tufts of hair, nibble erratic patterns in the foliage of the lime trees.

If a few of these energetic workmen are transferred from the privacy of their leafy retreat, to a public sphere of labour, as typified by the school "caterpillarium," their habits and methods will prove instructive, particularly to the child whose ideas concerning the sequences of moth development are confused.

The following notes are based on previous experiences; the observations have no claim to originality, being simple extracts from the "insect directory" of last year, the notebook. None of the species enumerated can in any sense be termed rarities. Some may be local, *i.e.* confined to districts where the prevailing conditions are suitable for their special needs, but for the most part they are our old friends, whose natural habitat appears to be the matchbox and canister of the schoolboy.

Finding the Specimens.

First catch your specimen. For our purposes the perfect insect (butterfly or moth) is best left at liberty; the chrysalis and caterpillar are the objects to be sought for.

Chrysalides (pupæ) are to be found almost everywhere in any sheltered nook affording protection from the vagaries of the weather.

Old wooden fences with projecting angles, and the crannies of tree trunks, are worth more than a casual glance. The pupæ of the Hawks and Buff Tips lie hidden underground. Leaves and twigs are utilised in many instances as a scaffolding for the silken cocoon.

However, the ubiquitous caterpillar is the mainstay of the amateur moth-rearer.

The following are the necessary impedimenta for a collecting expedition.

A vasculum to hold a supply of foliage, and a sachet containing an old sheet and a few boxes for the temporary reception of the larvæ.

With regard to the boxes, I have found those of the deep canister type to answer best. The larva of the Tiger, and many of the "loopers" (the arched-body contortionists) move with astonishing rapidity, and if a flat box be used, the ratio of escapes will in all probability considerably exceed that of the additions.

When the box is deep, a smart tap preparatory to the insertion of a fresh captive, will dislodge the would-be fugitives from the sides, and allow a moment's respite for the removal of the lid. Ample ventilation is necessary, otherwise, in hot weather, many of the inmates will be suffocated by reason of the lateral breathing tubes becoming clogged with perspiration.

On finding a solitary larva, the collector should search the immediate vicinity for others. The adult insect often lays its eggs in a batch, hence the resulting larvæ are found in proximity to each other.

Some carry the principle of sociability to the extreme.

The silver Ermine's speckled progeny, which denude the hedgerows in June, live together in harmony beneath a silken canopy spun by the united efforts of the whole community, and a complete brood may be secured in a few seconds by the simple process of cutting off a twig. Similarly with the Eggars and Lackeys in July. The Vapourer, the tufted fellow beloved of suburban gardeners, makes no such pretensions, but to gather a score or more from a tree is a comparatively easy matter.

Such a voracious feeder as the caterpillar must

necessarily leave palpable traces of its depredations. Where the foliage is seen to be partially eaten, it does not require the perspicuity of a Sherlock Holmes to detect the hidden cause of the mischief.

The novice should as far as possible avoid shaking the foliage, for those of his prospective captives whose confidence in the theory of protective resemblance is not sufficiently strong to warrant their remaining, have an artful trick of dropping into the débris beneath at the slightest provocation.

Hairy caterpillars are usually adepts in this particular direction.

To counteract this move, the experienced hand begins operations by spreading the sheet beneath the field of action; shaking can then be employed advantageously.

Having secured the requisite number of specimens, and made any notes which may be deemed suitable, a good quantity of the food-plant is secured.

If this is placed in water immediately on arriving home, it will keep fresh and provide sustenance for the caterpillars for several days.

In the case of the common town larvæ, indiscriminate feeders for the most part, leaves can be gathered daily from gardens close at hand, but when the collector with limited time has a batch of hungry larvæ feeding exclusively on a plant peculiar to rural districts, he will be able to appreciate this timely hint.

Care of Larvæ.

Directions have already been given; briefly they are as follows:—

Fresh food daily or as required.

Avoid handling as far as possible.

Keep the cage clean, renewing the sand at the bottom when necessary.

With a view to the welfare of the coming moths, a few pieces of dead stick stuck upright in the sand will furnish them a convenient perch whereon to dry their wings immediately after they emerge from the chrysalis.

Specimens to be sought for in June.

The Burnet Moth.

On grassy uplands and hillsides the plump, greenish-yellow, spotted caterpillars of this handsome moth are to be found in abundance feeding in various trefoils. If any difficulty is experienced in procuring the food plant, it is advisable to wait patiently until the end of the month, when the larvæ begin to construct their cocoons. In a favourable locality, such as the undulating district between Keston and Westerham, hundreds may be taken (by the greedy collector) in the course of an afternoon ramble through the grassy fields. The cocoons are slightly under an inch in length, shiny, boat-shaped, and cunningly attached to the stems of grasses. By reason of their colour, a pale straw yellow, and tapering ends, they appear at first sight to be mere bulging excrescences of the stems, but when once the eye gets accustomed, the task becomes easy. The chrysalis occasionally emits a buzzing sound by rubbing its tail portion against the surrounding silken envelope; when this happens, a dexterous use of the scissors will reveal the musician wriggling about in a state of great restlessness.

The perfect insect, a day-flier, which emerges in the first week of July, is a beautiful creature, his lustrous wings spotted with red on a shiny black background.

The eggs are laid in heaps similar to those of the Wood Leopard moth.

The Drinker.

So called from its curious larval habit of sipping the condensed moisture from the herbage. The prevailing hue of the caterpillar is dark brownish; at the sides are orange spots and thin tufts of pale hairs.

The Rev. J. G. Wood, and other field naturalists, give a list of the various grasses eaten by this creature, but in captivity they may be easily reared on the coarse rye grass obtainable from the lawns in the parks. This should be tied in bunches, sprinkled lightly with moisture, and stuck in the damp sand at the bottom of the cage. Renew daily, for they are greedy feeders.

In a wild state, the larvæ often forsake the grass temporarily and stray on to the lower twigs of the hedgerow; the collector should bear this in mind.

The cocoons, which are similar to those of the Burnets, save in size and texture, are commonly found in mid June, attached to the flower stems of the grass.

When the caterpillar is about to pupate, it will readily take advantage of a few stout grasses or pieces of straw.

Last year our moths at Stepney began to emerge on the 7th of July; the sexes, which exhibited marked differences, paired readily, and laid a considerable number of fertile eggs on the muslin of the cage.

The Gold-tail.

One of the commonest and most handsome of our caterpillars, and to be found on every hawthorn hedge in May and June. They are easily recognised by their brilliant red and white markings, and the slight protuberance on the sixth segment.

The caterpillars, together with those of the Magpie, Drinker, Tiger, &c., are hatched in autumn, and pass the winter in a state of hibernation.

Hawthorn is their staple diet. They become full fed in mid June, and spin a light silken cocoon in any convenient or inconvenient corner of the rearing cage.

Pupæ in general have smooth exteriors, the larval hairs being discarded with the old skin, but if we carefully break open the shroud in question and examine the brown mummy within, we shall find that the chrysalis of the Gold-tail moth is hairy also.

The use of these outgrowths is not quite apparent; they are certainly not organs of locomotion as in the case of the Wood Leopard, the pupa of which actually crawls. The accommodation of the pupal Gold-tail is too restricted to admit of crawling.

The snow-white moths (one smoky spot on each fore-wing) emerge in July, and are usually found in pairs on the low herbage.

At the extremity of her body, the female carries a

tuft of soft golden down, hence the distinctive name. This she utilises as a thatching material for her eggs, and those of us who have kept this moth, will know that her maternal instinct is in no way impaired by captivity.

One word of caution. Do not allow the children to handle the caterpillars. The loose hairs are charged with a powerful irritant—probably this is the reason why the birds avoid this conspicuous creature,—and their effect on a delicate skin is to produce a distressing rash.

The Tiger.

An inhabitant of the lowly nettle patch. The larva is black, covered with long silky hairs; the juvenile specimens incline to a chestnut hue.

No fears need be entertained concerning the food supply; this voracious creature will eat most plants. At the end of June it spins a loose transparent cocoon, through which the wriggling inmate may be seen divesting itself of its old larval skin, subsequently pushed into the corner of the hammock.

The moth is extremely handsome (what moth is not?) The fore-wings are creamy yellow, blotched with irregular chocolate markings; the hind wings brilliant red, spotted with steely black. No two of the perfect insects are precisely alike as regards the markings, and the species is peculiarly liable to variation.

It has been stated on good authority that curious varieties of the moth may be produced artificially by rearing the larvæ on food plant standing in solutions of salt and water, walnut leaves, &c., but unfortunately I cannot speak from experience.

The Vapourer.

To most people this creature needs but little introduction.

The caterpillar and the pupa also, as we shall shortly see, somewhat resembles that of the Gold-tail. Hatched in May, it does not attain its full brilliancy until full fed, but the June larvæ are easily recognised by the two projecting tufts of black hairs which spring horn-like from behind the head, also a similar tuft on the tail. Further, a row of whitish tufts enhances the beauty of its multi-coloured back. The larva feeds on several plants, lime and laburnum in particular. The pupal stage is entered upon at the end of July, and here again the light cocoon, which is spun in any convenient nook, contains a hairy chrysalis. The perfect insects emerge in August.

One of the most distinctive features of this species is the difference between the sexes. At the end of August, a small brown moth may frequently be seen fluttering erratically up and down in London parks, with an action suggestive of dancing.

This irresponsible creature is the male Vapourer looking for a wife.

The latter is an insignificant mortal, totally unlike her frolicsome mate.

Nature has provided her plump ungainly body with wings, but they are tiny rudimentary flaps, useless for flight; hence she is compelled to sit patiently on the old cocoon pending the arrival of her husband. The eggs are deposited on the surface of the cocoon. When a virgin female appears the amateur should put the rearing cage near an open window and watch the result.

There are many other interesting larvæ to be taken in the summer months, but the species mentioned above will be quite sufficient for a small establishment.

The eggs shown last month, two photos of which were inadvertently published, should be read as follows according to size:—

Wood-pigeon, partridge, mistle-thrush, sky-lark, chaffinch, and wren.

Next month.—"*Small Deer of the Brook and Hedgerow.*"

TEACHERS who are taking courses of Nature Study and students of field botany will welcome the serial issue of a book by Mr. Edward Step entitled, *Wild Flowers Month by Month*. It is published by Messrs. Frederick Warne & Co., and will prove very useful as a field companion, while it is so well got up and illustrated from photographs of flowers that it is as much in place in the drawing-room as in the study.

OBJECT-LESSONS IN HISTORY.

THE OLD PALACE, RICHMOND.

THE season of school excursions is now coming on, and one of the most popular places near London to which children are taken is Richmond, with its magnificent park and beautiful stretch of river scenery.

But such excursions should be made the occasion of some special teaching, and if the visit is prepared by an object-lesson on the part that Richmond has played in English history, not only will the pleasure of the trip be increased, but the history teaching will be made so much more real.

Unfortunately the material remains are few, and most visitors to Richmond follow the road from the station to the Park without paying attention to them. But if the teacher will take his class through one of the turnings on the right, about a quarter of a mile from the station, he will come upon a fine open space—Richmond Green—on the far side of which he will see the old gateway which forms the subject of our illustration. This is almost the only trace of the once famous Palace of Richmond. The visitor can pass through it and make his way down to the river and bear to the left to reach the bridge. This little deviation will show him the site and the remains of the palace.

The Manor House which existed at Richmond before the palace was built was the place in which Edward I. received Commissioners from Scotland and discussed the way the country was to be settled on the defeat of Wallace.

The palace itself was built by Edward III., and it was there that he died on June 21st, 1377. His deathbed scene is one of the most shameful in history, and the contrast between the miserable man dying there and the hero who led his army to victory is one of the saddest recorded. His son, "the Black Prince," had in vain tried to save his father from unworthy favourites, but he had died the previous year. An old chronicler, Walsingham, narrates that no friends, no kin, none connected with him by an untainted tie, were near him. Alice Perrers had kept him as long as possible in ignorance that death was closely approaching him; and on the last morning, when the dying man was speechless, when his eyes were dim, and his limbs

were growing cold, she drew the rings off his fingers and left him. His servants were plundering the palace. A solitary priest found his way to the royal chamber, and, placing a crucifix in Edward's hands, admonished him to pray in thought for forgiveness of his sins. Edward had just sufficient strength to kiss the crucifix and to express by tears his deep contrition before he expired.

The poet Gray in *The Bard* refers to the death of the founder of Richmond Palace.

"Mighty victor, mighty lord,
Low on his funeral couch he lies!
No pitying heart, no eye, afford
A tear to grace his obsequies.
Is the sable warrior fled?
Thy son is gone. He rests among the dead.
The swarm that in thy noon-tide beam were born?
Gone to salute the rising morn.
Fair laughs the Morn, and soft the zephyr blows,
While proudly riding o'er the azure realm
In gallant trim the gilded vessel goes:
Youth on the prow, and Pleasure at the helm;
Regardless of the sweeping whirlwind's sway,
That hushed in grim repose expects his evening prey."

The last part of this stanza also depicts the gay times at Richmond in the first part of the reign of Edward's grandson, King Richard II., who lived in the palace with his first wife, Anne of Bohemia. She was known as the "good Queen," and when she died at Richmond in 1394, her husband, in a fit of misery and rage, ordered the palace to be destroyed.

THE OLD PALACE, RICHMOND.

The palace was, however, rebuilt by Henry V., and Edward IV. spent much of his time there. Those who are familiar with Lytton's *Last of the Barons* will remember how frequently the scene is laid there.

Henry VII. enlarged the palace and rebuilt a part that had been destroyed by fire. The pupils will remember that before his accession to the throne he was called "Earl of Richmond," but this title he took from Richmond in Yorkshire, which is so called from the red hill—*rouge mont*—on which it is built. The name of the palace and the adjoining town was changed from Sheen to Richmond in his honour. The pupils also remember that one of Henry's chief faults was avarice, and in the enormous cellars of Richmond Palace, some of which still exist, he used to store his money, jewellery, and plate.

Henry VIII. took up his residence at Richmond after his accession with his first wife Catherine, and in this palace their little child Henry was born and died.

In 1520 the Emperor Charles V. having heard that Henry was likely to visit his rival, the King of France, decided to honour Henry by coming to England to see him. During his visit he stayed at Richmond and had some interviews with Wolsey, whose palace at Hampden Court was being built. In order to secure the support of Henry, Charles gave large sums of money to Wolsey. Wolsey was, however, the first statesman to pay attention to the "balance of power" in European politics, so although he took the money he gave help to Charles only when he thought that France was getting too strong.

In the catalogue of Henry's wives, Anne of Cleves stands fourth. She was divorced in 1540, and after that she lived in Richmond Palace, where Henry used to go and have supper with her, just to show that he bore her no ill-will.

In 1554 we read that Philip and Mary were living in Richmond Palace, and Princess Elizabeth went up by water from Somerset House to pay them a visit.

Later on Elizabeth was imprisoned in the Tower, and was brought in custody to see her sister at Richmond. Mary offered to set her sister at liberty if she would get married and settle abroad.

After her accession, Queen Elizabeth lived in Richmond Palace a great part of the time. Eric, King of Sweden, came over and courted her in this palace, but, as every schoolboy knows, he went away without marrying her. Elizabeth seems to have had a most extensive wardrobe, and some of her dresses were found at Richmond in 1883.

We read that she came to Richmond for the last time in January 1603. On the second of the following month Shakespeare acted in some of his plays before her, and on March 24th of the same year she died. Shortly before her death the Countess of Nottingham came to Richmond and confessed to the Queen that she had retained the ring given her by the Earl of Essex, who was executed in the Tower on February 25th, 1601, when by giving the ring to the Queen the Countess would have saved his life.

The Queen's funeral procession passed down the Thames in state barges and boats from Richmond to Whitehall, and although we must allow a little for the writer's imagination, there can be little doubt from what we read in the historian Camden that she was deeply lamented by her subjects.

After mentioning that "at every stroke the oars did tears let fall," and the "fish under water Wept out their eyes of pearl and swum blind after," the enthusiastic writer winds up with the peroration:—

"I think the bargemen might with easier thighs
Have rowed her thither in her people's eyes,
For howsoe'er, thus much my thoughts have scan'd,
She 'ad come by water, had she come by land."

In the first year of the reign of James I. the plague was so bad in London that the Courts of Law were held at Richmond Palace instead of in Westminster Hall.

James I. did not seem to have cared much for Richmond, and he gave the Palace and the beautiful park

of Richmond to his son Henry, and when that prince died in 1612, James gave the palace and park to Prince Charles, afterwards Charles I., who lived there a good deal both before and after his accession. The Duke of Buckingham was a constant visitor there.

In 1649, after the execution of King Charles, a great part of the palace was pulled down, but a part, including that which is now visible, was left for his widow, Queen Henrietta Maria, to whom Charles had given the palace in 1627, and who had for many years regarded it especially as her home.

NOTES OF LESSONS ON PROTECTIVE COLORATION AND MIMICRY.

Class.—The upper standards of either urban or rural schools. Although the children in rural districts have greater opportunities of coming directly into touch with Nature, yet this is a subject that is well adapted for consideration by dwellers in towns, since it is one that lends itself to exhibition purposes, and is therefore generally well illustrated in every museum that deals at all in natural history.

Time.—Two lessons of thirty minutes each.

Object.—The primary object of all these lessons is to interest the children in the world around them, thus furnishing them with an endless source of intelligent recreation; but the particular subject under consideration this month is one that cannot fail to teach the child high moral truths, and through the voice of Nature to speak to him of Nature's God.

> "Nature is but a name for an effect
> Whose cause is God. Not a flower
> But shows some touch, in freckle, streak, or stain,
> Of His unrivalled pencil."
>
> —COWPER.

Step I. Preparation.—From the very nature of the subject it is not much use setting the children to discover the examples and illustrations of protective coloration for themselves, since the beauty of every example depends on the extent to which it is able to evade detection. There are two methods in which the subject may be handled:—

1. By taking an animal and, if its environments are familiar to the scholars, identifying the points in which the animal agrees with its surroundings in appearance, or if its habits and mode of life are unknown these may often be deduced from its colour and appearance.

2. By indicating some of the chief types of protective colouring and mimicry so that the children can follow up the subject and look out for striking examples in their rambles.

The subject may be treated experimentally to a certain extent by means of goldfish. Half-a-dozen should be selected as nearly alike in colour as possible; three of them should be kept in a clear glass bowl and the other three in an opaque vessel, the interior of which has been painted black. If placed together again after a time the fish that have been in the blackened bowl will be found to be of a much deeper hue than the others.

Step II. Presentation.—A common sole is perhaps one of the best examples with which to commence the study of this interesting subject, the scholars being allowed to deduce what they can of its habits and surroundings from its appearance. The most casual observer cannot help noticing that the two sides of the sole are coloured differently, one side being white, and the other dark brown frequently marked with darker patches. Ascertain if the children are able to deduce from this the position the sole would take while swimming. Great care should be exercised at this stage that no answer is accepted unless the reason for the answer is given, otherwise it will lead to guessing, and the exercise will lose all educational value. If the fish swam in a vertical position there would be no reason for having the two sides coloured differently, but by taking a horizontal position the dark side harmonises with the bottom; if, however, the underside were dark also, it would stand out prominently against the light and be easily seen by any enemy that was swimming at a greater depth, but being white on the under side it is as difficult to detect it from below as from above. Almost all fish are white or silvery on the under side, but most of them are nearly black on the upper parts. Why then is the sole brown? The back of the herring shows that it lives in deep water, but the colour of the sole shows us not only that it passes its time in shallow water, but also that it prefers a sandy bottom to one of gravel. The wonderful agreement in colour may be shown by laying a sole on a dish full of wet sand. The habits and life history of the sole serve to illustrate several points closely connected with this subject.

1. The colour of an animal will often change to adapt itself to altered conditions.

When the sole is first hatched it swims about in a vertical position and both sides are alike; as it increases in size, however, it shows a partiality for lying at the bottom, and then it is that the two sides acquire different hues. A somewhat similar change of colour is seen in those animals in higher latitudes that do not hibernate during the winter, their fur varying in colour according to whether the ground is covered with the verdure of summer or with its winter mantle of snow. The Arctic Fox changes from brown or grey in summer to pure white in winter; the Russian Hare, so frequently seen in our poulterers' shops, is another example. Most children in the country know the stoat with its long, lithe body; in summer its back is a dark brown, the under parts yellowish white with a patch of pure white on the throat, but in winter its colours are much lighter. In northern latitudes it turns pure white, with the exception of the tip of its tail, and its fur, known as ermine, is highly prized. It is, however, in the insect world that the young naturalist will find his most interesting cases of protective colouring. Thus the Privet Moth furnishes a good example of sympathetic change of colour; the caterpillar of this moth is green, like the leaves on which it feeds, but at a later stage it goes down to the foot of the shrub, and shelters among the dead leaves lying there. Here it casts its bright green coat and assumes the pupa form with a dark brown case, similar in colour to the dead leaves among which it is lying.

2. Those animals that rely on their colour for protection rest during the day and feed at night.

During the day the sole rests quietly on the sandy bottom, but after nightfall, when all colours are lost in darkness, it becomes comparatively lively in its search for food. No matter how low in the scale the animal may be, it knows instinctively that it can only escape detection as long as it remains still, since a moving body is more easily detected than one that is stationary.

3. Many animals heighten the effect of colour by other means.

When the sole comes to rest it stirs up the fine sand with its fins, at the same time secreting a small quantity of sticky fluid, so that as the sand settles some of it will adhere to its back, thus increasing its resemblance to the sandy bottom.

The Caddis Fly, so common in our streams and brooks, disguises itself when in the larval state in a somewhat similar manner by glueing sand, small stones, straws, and bits of shell around its body until it cannot be distinguished from the débris among which it lies. The pupæ of the Puss Moth are hidden away in the cracks and crevices of the Poplar-tree, but it requires careful search to find one, as the cocoon has tiny chips of bark woven into it, thus rendering the likeness to the bark of the tree so close that it needs a practised eye to detect it.

Step III. Association.—The facts that have been learned of protective coloration in the particular case of the sole may now be applied to animals in general. Speaking broadly, we find that the colours of defenceless animals harmonise with their natural surroundings. What is more conspicuous than the giraffe as we see it in our natural history collections, yet travellers tell us that it resembles the chequered light and shade cast by the foliage so closely that it is extremely difficult to recognise.

This law applies not only to the full-grown animal but also to the larvæ of insects and the eggs of birds. See how closely the larva of the Peacock Moth with its pink spots on a green body resembles the heather among which it is found, or how beautifully the outline of the Plover's egg is broken up by half-tones in addition to the more conspicuous markings,

so that it is hardly recognisable at a little distance. We have seen how some creatures heighten the effect of simple colour, but there are others that go further still and actually mimic other animals or objects. The larvæ of the geometer moths, popularly known as loopers from their peculiar method of walking, are able to seize a branch with their hind feet and stretch out their bodies so that they resemble twigs of wood, and in this position they will remain for hours together. The Crimson-underwing Moth flashes in the sunlight like a brilliant jewel; but when at rest the brightly coloured parts are completely hidden, and it stretches out its body until it looks exactly like a lichen-covered twig. The under sides of the wings of the Indian Leaf Butterfly resemble a withered leaf both in colour and shape, but more curious still is the Leaf Insect of the East Indies. The wings and wing covers of this curious insect are broad and flat like a leaf, the resemblance being completed by the veins and colour. Most curious of all are those insects that protect themselves, not by making themselves as inconspicuous as possible, but by mimicking some other insect which is provided with means of defence. Take the case of Beetles. Many of these are protected from the ravages of birds by a strong skin which will resist the attacks of even the hard-billed birds, others possess an unpleasant odour or are bitter to the taste, so that the birds refuse to touch them. All these species are characterised by their brilliant colours, which they flaunt with perfect safety, but it is a curious fact that certain classes of beetles that are not protected in either of these ways have by some means acquired the colours and appearance of their more fortunate brethren, and are on that account avoided by birds. Again, certain classes of flies which have no means of defence will mimic the appearance and hum of the wasp or the bee, and thus gain the respect which these latter have earned by their formidable stings; one species of fly—the Volucella—whose larvæ is parasitic on that of the bee, mimics the bee so closely that it is able to enter the hives and deposit its eggs undetected by the bees themselves.

Step IV. Formulation.—

1. Defenceless animals are as a rule protected by their colour, which enables them to escape observation.
2. This colour may change when the surroundings alter.
3. The effect of colour may be heightened by other means.
4. Insects often assume the form and appearance of leaves, twigs, &c.
5. Defenceless insects often acquire the appearance of other insects that possess some special means of defence.

Step V. Application.—The application of this particular branch of Nature-study lies chiefly in the moral truths it teaches. The casual observer sees only the struggle for existence that goes on in the world. "Nature seems to say: Not the righteous but the strong shall inherit the land. Plant, insect, bird, what not—Find a weaker plant, insect, bird, than yourself, and kill it, and take possession of its little vineyard, and no Naboth's curse shall follow you; but you shall inherit, and thrive therein, you, and your children after you, if they will be only as strong and as cruel as you are." But when we look more closely into the secrets of Nature, we see behind all this the hand of a Divine Providence, for against every danger there seems to be a means of escape, and as one learns more of the marvellous ways in which the very lowliest forms of life are protected, the Divine teaching of the sparrow's fall is borne in upon the mind with irresistible force.

WELL-KNOWN TEACHERS AT WORK: MR. ROBERT BUNTING.

IT was shortly after the list of successes in the Cambridge Local Examination had been published that I made a call at the Burghley Road Council School, primarily for the purposes of this interview with the head-master, and incidentally to congratulate him and his staff upon the brilliant successes of the pupils of the school in the late examination.

"I am but reaping where others have sown," said Mr. Bunting. "In taking up the work here I realise that I have succeeded to an inheritance. My predecessors have by their hard work and skill raised the school to such a high state of efficiency that I feel the responsibility very keenly, and hope to hand down the school's record, when the time shall come, not only unimpaired and untarnished, but with increased honour."

Mr. Bunting was good enough to trace in an interesting way the steps by which the school had risen to its present high rank. It had enjoyed a succession of very capable and enthusiastic men as head teachers, backed throughout by a very loyal and efficient staff. In its earlier career the school was under the control of Mr. Girling, now inspector under the London County Council. He was followed by Mr. T. W. C. Stileing, a man who not only threw his whole heart and soul into the work, but endeared himself to all his staff by his very sympathetic and genial bearing towards them. It was Mr. Stileing who "made" the school, and his memory is still cherished by those whose good fortune it was to work under him. It was at this time that the first developments were made in Higher Standard work. After some years the school was organised as a senior school, all standards below the fifth being drafted

IN THE LABORATORY (ADVANCED CLASS).

to another building. Next the upper portion of the senior school was organised as a Science school, and existed as such for three years. It was in the second year of this development that the hand of death removed Mr. Stileing after a long illness. The good work, however, thus well begun, was continued on the appointment of Mr. T. H. Jones as head-master. Under him the higher work was further developed, and the school obtained some remarkable successes in the L.C.C. Intermediate Scholarships and the Cambridge Local Examinations. After spending some two years at this work Mr. Jones received an appointment to the inspectorate under the late Board, and Mr. Robert Bunting was chosen to succeed him at Burghley Road. That a very high standard of work had been set and has been well maintained may be seen from the record of successes set out below.

Results published during the year.	L.C.C. Scholarships.				Christ's Hospital. £50 for 4 years.	Cambridge Local.	
	Intermediate. £55 for 4 years.	Commercial. £55 for 4 years.	Technical. £15 for 2 years.	Junior. £10 for 2 years.		Honours.	Passes.
1903	3	2	2	10	2	7 (4 distinctions)	12
1904	5	1	3	9	1	12 (3 distinctions)	8

The following is the analysis of the Cambridge Local Results published this year:—

Boys entered	23
Successes	23
First Class Honours, 1st Division	10 (18 distinctions)
" " 2nd "	4
Other Honours	3
Passes	6

The boys entered from the 4th Year Division A (teacher, Mr. Hotchkiss), all succeeded in passing with honours. Division B (Mr. Cantwell) gained 4 honours.

Such results are not matters of accident, and I therefore requested Mr. Bunting to give me some idea of the general organisation of the school. It appears there is accommodation for some five hundred boys. These are divided into twelve classes, three to each year, the school course consisting of four years' work. The boys are drawn chiefly from a junior school—really an offshoot of Burghley Road, and several contributory schools. This arrangement has worked fairly well, but whether this particular method of supply will be continued in the future is somewhat uncertain. There is a possibility that the new scholarship scheme of the L.C.C. may make provision for a supply of suitable children for the Higher Schools. Mr. Bunting is therefore hopeful that the work of the Higher Grade and Higher Elementary Schools is likely to be in the future not only more meritorious as far as examination results go, but of greater benefit both to the individual pupil and to the community.

The course of work follows practically the same lines as that of the Organised Science School, the exception being that in the junior classes a little more time is given to literary subjects and a little less to science. The general character and scope of the work remain the same.

The arrangement of a time-table for a school like this becomes a work of art. Provision must be made for Scripture, Drill, Manual Instruction, the visits of the French and Art Masters, instruction in the Practical Science Laboratories; and when all these have been

fitted to meet the exigencies of time and place there remain the ordinary class subjects. On examining the time-table I noted how simplified a complex arrangement may become by the exercise of a little method. Each particular subject was set out in a definite colour.

MR. BUNTING AND HIS STAFF.

At a glance one could see, for example, the complete arrangements for the whole school in the subject of Manual Instruction. Another glance would give the general organisation for Practical Science, and so on. It clearly showed also the amount of time devoted to the different subjects in each class. Mr. Bunting, with a very genial twinkle in his eye, suggested that I might like to make a copy of the time-table. Having regard to my stock of patience, discretion forbade, and I was contented to summarise briefly as follows:—

Mathematics	. . .	6	hours per week.
English[1]	. . . .	6	" " "
History and Geography	.	2	" " "
French	. . . .	3	" " "
Science (Juniors)	. .	2½	" " "
" (Seniors)	. .	5	" " "
Art	. . . .	2	" " "
Manual Training	. .	2	" " "

This summary gives an idea of the average amount of time devoted to the various subjects in the different classes, after due allowance has been made for Scripture, Drill, and Singing.

As regards the standard of work aimed at I gathered the following facts.

In Mathematics the course is arranged to cover the syllabus of the Science and Art Department in Stage II. A few of the senior boys will probably try Stage III. this year. French is treated from the commencement by conversational methods, in addition to grammatical exercises, dictation, and composition. This work is done chiefly by the staff, assisted linguistically by the weekly visit of a native French teacher—M. Bonhommet.

[1] This includes Dictation, Composition, Reading, Recitation, and Grammar.

The Science teaching is essentially practical. From the first the boys are taken into the laboratories and are given simple practical exercises under the guidance of masters who are specialists in this work. The chief aim here is to develop the observing and reasoning faculties more than to cover a wide range of the subject. The Chemical Laboratory, under the care of Mr. Jenkins, and the Physical Laboratory, in charge of Mr. Hart, are both models of neatness, and indicate the careful training the boys receive at their hands. The Art work is chiefly in the hands of Messrs. Davis and Layzell, both certificated art masters. In this branch of work Mr. Bunting himself, being an art master, takes special interest. Having mastered the correct principles of drawing, any pupil showing special aptitude in this work is encouraged to cultivate his talents in a particular direction. Capital studies of plant life from nature have been done by some of the older boys, and also some very creditable work in oils from still life. The school is large enough to demand a Manual Training Centre of its own, and here, under Mr. George Evers, the boys turn out their models in a style which for accuracy, neatness, and finish I have rarely seen equalled.

Looking back over the years of his own varied career, Mr. Bunting was able to speak of the personal pleasure and interest he felt in higher-grade work. As a P.T. he had to live the strenuous life of the old days—teaching all day, studying at night, lessons in the early morning. As a teacher under the late Board he survived the cares and responsibilities attached to the supervision of slum schools before being given charge of a large better-class school, and finally that of Burghley Road. Throughout he has been an ardent

IN THE LABORATORY (ELEMENTARY CLASS).

believer in the development of self-reliance in his pupils, not only in intellectual work, but also in moral conduct. The organisation of such a school as Burghley Road affords greater opportunities in this way than a

school of the ordinary type. The larger classes and the tender ages of the majority of the boys in an ordinary school render a more or less rigid system of discipline absolutely necessary. But at Burghley Road the lads are drafted into the school at the age of eleven to twelve. During their first year they are subjected to the usual discipline of the elementary school. In the next year rigid discipline is slightly relaxed in certain directions, and a spirit of confidence between master and pupil is cultivated. As the pupils rise through the school they develop a sense of responsibility for the care of their own class-rooms, the behaviour of their own class, the tone and reputation of their own school. As is usual, there is a formal opening of the school each morning, but no general dismissal. It is interesting to note the orderly way in which the boys of the senior classes leave their rooms, and in a perfectly free, unrestrained manner, without the supervision of a master, make their way out of the building. They enjoy the freedom and unrestraint; and the trust imposed in them results in good order, and openness and confidence between master and pupil. The boys of the junior classes also look forward to the time when, as senior students, they shall be worthy of similar trust and privilege.

Speaking of the staff generally, and the great credit due to them for the success of the actual work of the school, Mr. Bunting was specially pleased in pointing out that most of the class masters, though responsible for the general work of a class, had made one or more subjects a speciality. One took a deep interest in literature, another in history, another in geography, and so on, and wherever possible it was his aim to make use of their special qualifications in the general work of the school.

Mr. Bunting's chief interests are undoubtedly in his school, but it will not be out of place here to record that, as a relaxation to the great responsibilities attached to his work at Burghley Road, he finds time to draw and paint; to do an amount of literary work of professional character; and to take an active part in N.U.T. Association work. His writings include Geographical Readers and Handbooks of Object Lessons, all of which are illustrated in black and white, and in colours, from his own pen and brush. His work on behalf of his profession has been recognised by his election to the Vice-Presidency of the London Teachers' Association—a body numbering some eleven thousand members.

In parting with Mr. Bunting I asked, "What of the future?" Under the new authority he is hoping for more scope and greater freedom to develop the school still further. But at present everything is very uncertain. The Council has decided, subject to the approval of the Board of Education, that the school shall be transferred to a new building suitable for its recognition as a Higher Elementary School—which it is at present excepting only the name. The Board of Education has not yet replied. The time is an anxious one for all concerned. Great efforts are being made all over the country, as well as in London, to develop the secondary school system. Whether schools of the type of Burghley Road will continue to exist as part of the Elementary system the fates alone can tell. The withdrawal, by the Act of 1902, of scholarship allowances from the Elementary system was a heavy blow; but there is more than a hope that a way out of the difficulty may be found, and that the crisis may pass and leave these schools more firmly established than ever.

THE WOOD-WORKING DEPARTMENT.

NOTES ON AN EXPERIMENTAL COURSE OF LESSONS ON AIR AND WATER.

BY EDWARD J. RUSSELL, D.SC. (LOND.),

Lecturer in Chemistry at the South-Eastern Agricultural College, Wye.

(*Continued from p. 570.*)

How Carbonic Acid travels from Town to Country.

IT has already been seen that carbonic acid is produced in quantities in the neighbourhood of human and animal dwellings, and that it is absorbed partly by plants and partly by the water of rivers and seas. We have now to discover the ways in which carbonic acid moves from the places where it is produced to those where it is taken up. The agencies concerned fall under three headings:—

1. Rain.
2. Wind.
3. An imperceptible movement known as diffusion.

Effect of Rain.

This cannot well be made the subject of school experiments. The general effect will be obvious from the remarks on page 569, and in order to fix our ideas we may remember that 1 inch of rain means a fall of 100 tons of water per acre, and that this weight of water will at ordinary temperatures dissolve about 12 cwts. of carbonic acid.

Effect of Wind.

Experiment 72.—Fill a jar with carbonic acid, plunge in a lighted taper to show that it is full, then blow vigorously with a pair of bellows into the jar and test

again. One or two strokes usually suffice to empty the jar.

The fresh feeling one experiences in walking through a town after a storm of rain and wind is probably connected with the removal of excess of carbonic acid and other atmospheric impurities by these two agencies.

Diffusion.

Experiment 73.—Fill two jars with carbonic acid, show by the taper that they are full, cover one with a well greased glass plate, leave the other open in a place free from draught. After a sufficient interval, which depends on the dimensions of the jar and its opening, and must therefore be determined by a previous trial, it will be found that the taper will burn in the open jar, showing that the carbonic acid has escaped, whilst the closed jar still retains the gas.

The children suggested that the gas had "floated out"; the idea is not quite correct, though it gives a picture of what has happened. On page 233 it has been stated that the best mechanical conception of the air is that it consists of an enormous number of very minute particles moving at high speeds, and the phenomena of air-pressure can then be explained as being due to the bombardment these particles produce. The same view holds for other gases, and also explains all the facts of diffusion; particles which strike the wall are of course driven back again, those which strike other particles, either of carbonic acid in the body of the jar, or of air at its mouth, have their future movements regulated by the well-known laws of impact. But in course of time the jar will cease to be full of carbonic acid.

Experiment 74.—Fill a cardboard box with carbonic acid, seal down the lid with stamp paper, and leave for a time. The gas diffuses out, no matter how carefully the visible holes have been stopped up. The process is delayed if the box is covered with glazed paper.

A wooden box shows the same phenomenon, so also do walls of plaster, bricks, &c. Diffusion, in fact, is a very potent factor in purifying the air of rooms. It is on record that in a chamber of 2650 cubic feet capacity, with ordinary brick and mortar walls, the air changed once per hour when the temperatures inside and outside were 18° C. and zero.

Experiment 75.—Repeat Experiments 73 and 74 with coal gas; diffusion is found to take place more rapidly. It is a general rule that the lighter a gas the more rapidly it will diffuse.

An illustration of diffusion through plaster is usually furnished by the ceiling. As air diffuses through it carries some of the dust with it, but this rapidly filters out. In parts where there are rafters or beams diffusion is hindered, and but little air passes through; in other places air goes through more rapidly, taking with it the dust. A pattern is thus worked out on the ceiling. Hot air, being lighter, will diffuse more rapidly than cold air, and the pattern will be very distinct near to a gas-burner. The dirty ceiling above an incandescent burner is rather owing to this cause than to any deposition of soot.

The children, being thus familiarised with the idea of diffusion, were able to follow the succeeding experiments:—

Experiment 76.—Take a porous pot such as is used in certain electrical batteries, close the open end with a plug fitted with a glass tube, the other end of which is joined to the "fountain flask" of Experiment 28, page 341. Place a jar of coal gas, or, better, hydrogen, over the porous pot; the light gas diffuses in more rapidly than air diffuses out, and the increased pressure in the pot and flask sets the fountain working. Now withdraw the hydrogen jar; the gas diffuses out more rapidly than air can re-enter, and there is diminished pressure. Air consequently bubbles in through the fountain flask.

The fountain flask, it will be remembered, consists of a bottle containing some coloured water fitted with two tubes, each provided at the end outside the flask with a piece of india-rubber tubing and a pinch-cock. The shorter one just passes inside the cock, the longer one dips under the liquid, and at the other end a glass jet must be fixed on to the rubber tubing.

Experiment 77.—Use the same apparatus, but arrange so that the porous pot may stand in a jar of carbonic acid. The reverse change now takes place, air diffuses out from the plug more rapidly than carbonic acid diffuses in, and the pressure inside the apparatus decreases. When the jar is removed air diffuses in so quickly that for a time there is an increase of pressure in the apparatus.

For special occasions various modifications of these two experiments may be devised. One of the most striking of these is to substitute a U tube containing a little mercury for the fountain flask, and arrange that when the mercury is driven upwards it shall touch a wire and close an electric circuit, thus ringing a bell, firing an explosive mixture, &c.

It may interest the teacher to point out that the perfect mixture one anticipates from the phenomena of diffusion can, theoretically, only be produced when the action of gravity is uniform, and may therefore be neglected. In a still atmosphere extending some miles in height, where the force of gravitation is greater at the lower level than higher up, the laws of diffusion show that the gases should separate, the heavier ones being at the bottom and the lighter ones at the top. This is what we should expect in the atmosphere of the earth and of the sun, if it were not for the churning up of the different constituents produced by various disturbances. To some extent such separations do appear to take place.

Water.

Occurs everywhere. (*a*) As vapour in the air.

Experiment 78.—Put some ice and water into a beaker, notice the dew which condenses on the outside.

(*b*) In almost every solid body.

Experiment 79.—Put some wood, flour, coal, soil, or almost any solid body that happens to be at hand, into a test tube joined to a U tube by a piece of glass tubing bent at right angles. Heat the test tube, cool the U tube, and observe the condensation of moisture. If the heating is continued too long, tarry matters may be obtained by decomposition.

By taking the necessary precautions, the amount of water in various substances can be determined. Thus it has been found that apples contain 61·5 per cent. of water, potatoes 67 per cent., white bread 35 per cent., cabbage 77 per cent., meat 40 to 60 per cent.

Evaporation of Water.

Experiment 80.—Moisten a piece of blotting paper, leave for a short time. The water rapidly changes to vapour which diffuses away.

Experiment 81.—Weigh a saucer of water at intervals of a few hours. On a warm dry day the loss of water is quite considerable.

By this process of being converted from liquid to vapour water is perpetually being transferred from rivers and seas to the air. Evaporation goes on at all temperatures, and does not stop even when the water is frozen.

INDIAN CLUB EXERCISES

FOR SENIOR PUPILS IN ELEMENTARY SCHOOLS.

BY H. RIPPON-SEYMOUR,

Chief Instructor, George Watson's College, Edinburgh; Member International Congress on Physical Education, Paris, 1900; Author of "Physical Training," etc.

Third Series.

The Windmill.

IT is supposed that the pupils have thoroughly learnt the "double combined swing" described in the Second Series, and they should therefore be able to attempt this swing. The title of the swing very aptly describes the movement, as the arms are circled in the

FIG. 1.

manner for the "double combined swing," but one arm *follows* the other, instead of moving in unison with it.

"**Ready**."—As before described.

"**One**."—Commence a "single *inward* combined swing" with the left hand, and as the left club passes the legs allow the right hand to follow in the same direction, thus making the movement described for a "single *outward* combined swing." (Fig. 1.)

By the time that the right hand club has reached the legs the left hand club should be making the inward rear twist behind the head, and this should be counted as "two." (Fig. 2).

As the left hand club leaves the head and continues its journey *inwards*, the right hand club is on its way to make the outward rear twist.

It is scarcely possible to perform this swing "by numbers," as the movements are too independent of

FIG. 2.

each other; they must follow in natural sequence. The movements of this swing are frequently seen performed (by mistake) by pupils who are learning the "double right (or left) combined swing," where it will frequently be observed that the clubs are allowed to separate one from the other on their journey, thus producing—somewhat imperfectly and quite unconsciously—the "Windmill" swing.

When the pupils have mastered the "Windmill" to the right side, they may commence learning this swing to the left side. It is quite easy to remember which hand leads off, for the rule is: when swinging to the right, the left hand commences, and to the left, the right hand.

If this swing be thoroughly mastered on both sides, the pupils will have made a good stride towards proficiency in club exercises.

Alternate Outward Combined Swing.

This swing usually puzzles beginners, but once learnt is one of the most simple and pleasing exercises.

"**Ready**."—As before.

"**One**."—Make an "outward swing"—in front of the body—with the right hand, and at the same time an outward rear swing or twist with the left hand. (Fig. 3.)

"**Two**."—Continue the movements with each hand as described for "single outward combined swings," each hand moving alternately or opposite to the other, *i.e.* when the right club is behind the head, the left is in front of the body, and *vice versa*.

This swing can also be performed "alternately inwards," but is somewhat more difficult.

Double Outward Combined Swing.

"**Ready.**"—As before.

"**One.**"—Make a double outward swing with each hand and club together—as described in the first series.

FIG. 3.

"**Two.**"—Make a double outward rear swing or twist. (Fig. 4.)

The completion of this movement should bring the

FIG. 4.

pupils into practically the "ready" position, when they will continue the swings in front and then in rear as before.

Double Inward Combined Swing.

This swing is exactly the reverse of the preceding one.

"**One.**"—Make a "double inward swing" in front

"**Two.**"—Make a "double inward rear twist," and repeat the motions "one" and "two" until proficient.

This will conclude the Indian Club Exercises, as it will be found that it is almost impossible for *classes* of pupils in schools to progress much beyond this point.

Any pupil with special aptitude for this kind of work will be able to discover for himself particular combinations of exercises which are beyond the capacity of the majority of pupils in elementary schools.

JIU JITSU

SOME INTERESTING EXERCISES FROM THE JAPANESE SYSTEM OF PHYSICAL TRAINING

ADAPTED FOR SCHOOL USE BY H. RIPPON-SEYMOUR,

Chief Instructor, George Watson's College, Edinburgh; Member International Congress on Physical Education, Paris, 1900; Author of "Physical Training," etc.

AT this time, when so much is being said and written in support of the value of "organised games" as a part of school physical training, it may not be amiss to place before teachers and others interested in the

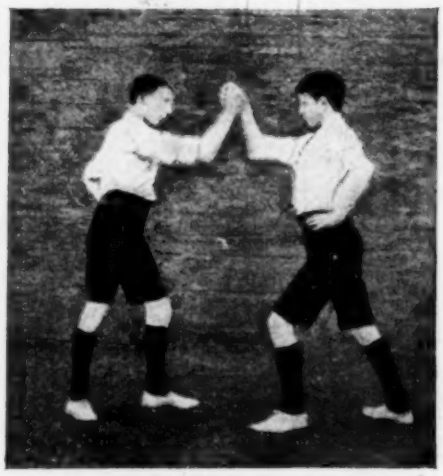


FIG. 1.

physical development of children, a few simple and interesting antagonistic exercises which are of the greatest value physically.

As, however, all of these movements involve a certain amount of strain, it is best to allow only those children who have undergone at least six years' school physical training on Swedish lines, or over thirteen years of age, to participate in them.

Hand-pushing.

Draw up the class, in two ranks at half interval, each facing the other, and sized as equally as possible.

"**Ready.**"—Each pupil will advance the left foot a short pace forward, and at the same time grasp each

other's right hands; the right arm nearly straight and in line with the shoulder, the left hand on the hip. (Fig. 1.)

"**Go.**"—Leaning *slightly* forward, each tries to push the other back; though in learning the movements, and for the sake of the exercise obtained, it is better to merely press hard on each other's hands for (say) 30 seconds without either pupil trying to gain an absolute victory.

At the end of the prescribed period—which the teacher may time with a watch—and after a short rest, the pupils again engage each other with the other hand, the right foot being brought forward in this case.

Arm-pressing.

"**Ready.**"—The class being formed as before, one rank facing the other, the pupils advance the right hand and left foot in somewhat the same manner as before, but the fist of the pupil is closed; and the contestants' hands are engaged as shown in Fig. 2.

"**Go.**"—The wrists are pressed strongly against each other, each pupil trying to draw their own arm across their chest. To correctly perform this exercise, the movement should be made by carrying the arm across the body toward the opposite shoulder, and not by leaning over and using the weight of the body; and the arm must be kept straight.

This exercise should also be made one of endurance and not merely performed for the sake of beating the

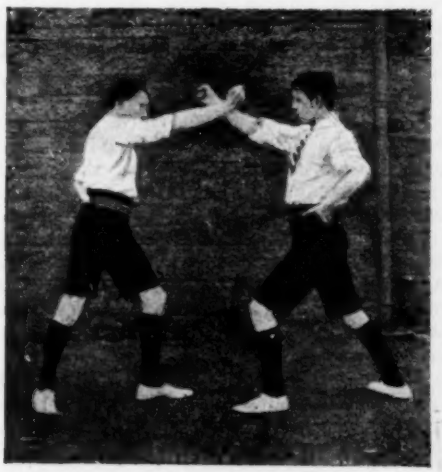


FIG. 2.

opponent; therefore the pressure should be continued for the same length of time as in the previous exercise; the pupils should then change hands and feet.

Pole Exercises.

For the purpose of performing these exercises, nothing can be better for children's use—and at the same time cheaper—than ordinary broomsticks. The exercises will be found very popular with children, as they introduce that natural spirit of antagonism and emulation, without which no game appeals for long to the ordinary British child.

1. *Pole-pushing.*

The class should be formed up in two lines facing each other, the front rank holding the pole by the right side, in the same way as shown in the Barbell Exercises for the position of "attention."

"**Ready.**"—On the word "Ready" the pupils of the front rank raise the pole to a horizontal position at the right side of the body, grasping the end with the right hand, which should be against the right thigh, and a point near the centre with the left hand, both arms straight, at the same time advancing the left foot from

FIG. 3.

12 to 20 inches to the front, the left knee slightly bent. The rear rank assume a like position at the opposite end of the pole. (Fig. 3.)

"**Go.**"—Both contestants immediately exert a strong forward pressure, keeping the *right* arms straight, and leaning only *very slightly* forward, so that the weight of the body plays only a very small part in the exercise.

The contest is decided when one of the contestants can force the other back sufficiently far to enable him to cross an imaginary line drawn midway between their left—or advanced—foot.

"**Rest.**"—The front rank pupils withdraw the pole from their opponents in the rear rank, and resume the position of "attention."

As in the preceding exercises, the actual physical benefit is greater when the exercise is made one of more or less time endurance, and not merely so as to win in as short a time as possible.

The exercise should afterwards be performed with the pole at the other side of the body.

2. *Pole-turning.*

"**Ready.**"—The pupils face each other with the pole held as described above.

"**Go.**"—The exercise consists in endeavouring to twist the pole one complete revolution, on its longer axis, through the other contestant's grasp. The movement is intended to be made mainly from the wrists; much in the same manner as when using a large screwdriver; and the pupils must be cautioned against wrestling, or unduly jerking the pole, or raising the hands above the height of the waist. A small mark or

line should be made on the pole at or near the centre, thus:—

to indicate to the pupils that a revolution has been made.

Here, too, the pupils should change the exercise by coming to the "ready" with the pole at the *left* side of the body.

As has been stated before, these exercises involve a certain amount of strain, but if carefully and regularly performed, they will develop the muscles of the neck, shoulders, forearms, back, and legs, and while being a great deal more interesting than many of the more rigid forms of physical training now in vogue, are equally as valuable.

Pole-pulling.

This exercise is not recommended for *general* use in schools, but may occasionally be allowed between the stronger of the boys. As a general rule, girls should not be permitted to try it.

Two pupils sit facing each other, feet to feet and knees bent, the pole held as shown in the figure (4).

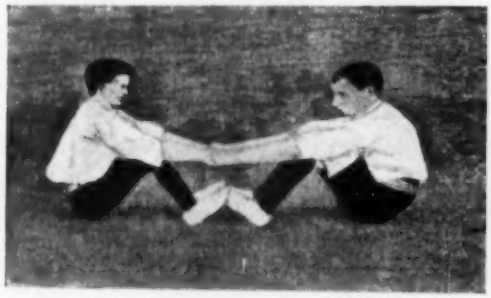


FIG. 4.

At the word "Go" each pupil pulls as hard as possible backward, and endeavours to straighten his knees.

The contest is decided by one pupil pulling the other to his feet.

It will easily be seen that a very great strain is put upon each contestant's back, and if, as frequently happens, two very evenly matched boys become "locked," viz., each unable to move the other, a short time limit should be put upon the match, as the muscles of the back may be severely strained by overdoing the exercise.

THE INSPECTOR'S NOTEBOOK.

BY AN INSPECTOR OF SCHOOLS.

Letters should be addressed—INSPECTOR, c/o THE EDITOR, 35 Paternoster Row. *Questions requiring prompt answers are dealt with by post if two stamps are enclosed.*

F. M. asks whether the Certificate of the Froebel Union qualifies under Art. 51, and, if so, where she could obtain tuition.

Answer.—Schedule I. of the 1904 Code gives a list of examinations, any one of which qualify. For teachers in infant schools or classes only—(*a*) The examination for the Elementary or Higher Certificate of the National Froebel Union, (*b*) The First Class Certificate of the Manchester Kindergarten Association qualify to rank as uncertificated teachers. I know of no classes where tuition is given. Write to Miss E. H. Maclean, 4 Bloomsbury Square, W.C., for a syllabus, and enclose 3d.

M. L. P. is an uncertificated assistant who, through imperfect sight, is unable to study. She desires to become a drill instructress, and asks for information and advice.

Answer.—There are distinct possibilities in this direction. Could you not obtain an assistantship in a large city like Leeds, Bradford, or Manchester, where physical exercises' instructors are employed, and attend classes evenings? I should not advise you to throw up your position until you have qualified well as a teacher of drill. You might then watch the papers and apply for any vacancy that is advertised. You must in future sign your full name to your letters, or no answers will be given.

M. C. sends me the Scotch Certificate syllabus, and asks me what is understood by the following:—

"Elementary properties connected with angles, straight lines, triangles, squares, rectangles, parallelograms, and circles. Simple exercises in drawing to scale by means of instruments with measurements, and arithmetical calculations arising therefrom"?

Answer.—The following books will be found lucid and sufficient for the purpose:—

(1) "Preliminary Geometry." 1s. Blackie & Son. By R. Roberts, B.Sc. (Mostly practical, but a logical course; not the old system of bisecting a line, then drawing perpendiculars. A chapter on Drawing to Scale is included.)

(2) "A New Geometry." 1s. 6d. Blackie & Son. Same author. A thorough course, theoretical and practical; probably Part I. of this book, along with Preliminary Geometry, would meet the requirements.

H. T. writes—(*a*) In what paper or papers shall I find advertisements for 'Teachers wanted' in Australia? (*b*) Are there many wanted there, and do you think it likely that an untrained certificated teacher would get a post?

Answer.—Personally I think you would not have much chance of securing such a post as you desire. The Australian colonies train their own teachers. I know of no papers you could refer to. You might perhaps obtain a post in South Africa, if that would suit you. Which part of Australia do you wish to go to? You will find the names of the several representatives on page 81 of *Whitaker's Almanac*. Write to one of these, c/o the Colonial Office, London.

X.Y.Z.—"I have passed scholarship in the third class. If I sit for the examination again in order to raise my class, but have the misfortune to fail, will my third class hold good?"

Answer.—Yes.

J. A., writing in March, wants to know if she has time to prepare for the 1906 Certificate Examination, and to obtain a pass thereat.

Answer.—This is a difficult question to answer, as you give no particulars about yourself. Under ordinary circumstances I should say it would take two years' regular and systematic study to pass the Certificate after passing the K. S. Examination.

A. G. H. was educated at one of the High Schools, and has been a private governess for nine years. She wants to obtain the Elementary Certificate in order to obtain a post in South Africa, and seeks information as to the length of time it will take to qualify.

Answer.—See answer to J. A. You must send me fuller details if you wish a serviceable reply. It would, I feel sure, take you two to three years to pass the Certificate Examination, for which you cannot sit unless you are twenty years old and have served a year as an uncertificated assistant in a school. You had better buy a copy of the Red Code (N.U.T. edition), 1s., and look through the list of qualifying exams. on page 37, one of which you must pass before you begin work for the final or Certificate Examination. Write to me again if you wish further advice.

F. C. H. holds a Cambridge Higher Local Honours Certificate and other certificates, and has spent a year at Newnham. She desires advice as to how to obtain the headship of an elementary village school, and as to how she may obtain cognisance of the regulations, &c., devolving upon a certificated head teacher.

Answer.—Buy a Red Code (N.U.T. edition), 1s., and study Schedule I. especially, also the book generally.

You are qualified at present as, what is technically known as, an uncertificated teacher. You are eligible to take an assistantship at once in any school, and after serving in that post for a year you could take a village school of not more than forty scholars, provided that you are by an inspector reported as specially qualified to take charge. You should write to the Secretary, Board of Education, Whitehall, S.W., for a copy of the Certificate syllabus. I shall be glad to hear from you again later on, and to help you by further advice if needed.

Arithmetic Scheme A or B.—Several teachers have inquired whether Scheme B is now compulsory. In Schedule VI. of the 1904 Code is to be found the schemes in Reading, Writing, and Arithmetic under which examinations for proficiency certificates are to take place. It is there stated that Scheme A will probably be withdrawn in 1905. This refers only to Labour Certificate Examinations. There is nothing to prevent any teacher from continuing to use Scheme A in his or her school. If, however, any children present themselves for Labour Certificates the inspector will give sums in Scheme B.

THE HARMSWORTH ENCYCLOPÆDIA PRIZE COMPETITION.

OUR readers will be interested to learn that the public demand for this work shows no signs of falling off. The Fifth Number, which will be published before this number of the *Practical Teacher* is issued, completes Volume I. Cases for binding are supplied by the Publishers, and with each case will be presented a preface on "How to Use an *Encyclopædia*," by Sir Alfred Harmsworth, and the first part of an Appendix containing the pronunciation of all the difficult and unusual words occurring in Volume I. As this Appendix will form a valuable addition to the *Encyclopædia*, subscribers should lose no time in ordering the case with which it is presented.

The Editor is gratified to learn that many head-teachers have encouraged their upper-standard scholars to provide themselves with the *Encyclopædia*, and that it is in daily use in a number of schools. The scholars thus early in their lives become possessed of a most valuable work of reference, and they are practised in the useful art of seeking and acquiring information for themselves. Both in the matter of essay-writing and home-work, the *Encyclopædia* may be a valuable aid in upper class-work. The Editor will be glad to hear from all teachers who have adopted this plan, and will welcome suggestions for a series of competitions confined to scholars in Elementary Schools.

SECOND SERIES OF COMPETITIONS.

CONDITIONS.

(1) The Editor's decision is final.
(2) All competitions must be accompanied by the Coupon cut from the last page (cover) of the *Practical Teacher*.
(3) The Name, School, and Standing of each competitor must appear on every competition sent in.
(4) All competitions must be addressed EDITOR, *Practical Teacher*, 35 Paternoster Row, London, E.C., and be received **not later than June 30, 1905.**
(5) A competitor may send as many competitions as he pleases, but each competition must be accompanied by a Coupon.

SERIES II.

OPEN TO ALL TEACHERS.

I. **Post-Card Competition.**—Write on a post-card a list of twelve subjects (selected from Parts IV., V., and VI.), which you consider most suitable for discussion at a debating society.

The list of most suitable articles will be chosen by the votes of the competitors, and the competitors coming nearest to this list will be the prize-winners.

First Prize, £2, 2s.; Second Prize, £1, 1s.

OPEN TO ALL CERTIFICATED TEACHERS.

II. **"Scholars' Encyclopædia" Competition.** — Select two short articles from Part IV., two from Part V., and two from Part VI., and re-write them in a form suitable for scholars of from eleven to fourteen years of age.

First Prize, £2, 2s.; Second Prize, £1, 1s.

OPEN TO PUPIL TEACHERS AND EX-PUPIL TEACHERS.

III. **Connecting Links Competition.** — Compose six questions from Parts IV., V., and VI. similar to the following, and give the answers to them.

Example.

Question.—Connect the "British Solomon" with Bombay.

Answer.—The British Solomon was James I. His grandson was Charles II., who married Catherine of Braganza, and she brought her husband the Island of Bombay as part of her dowry. (See article Catherine of Braganza, p. 1225).

In all cases the answers should contain references to the article and page containing the solution.

First Prize, £2, 2s.; Second Prize, £1, 1s.

The Awards in the First Series will be announced in the July Number of the "Practical Teacher."

The Practical Infant-School Teacher.

SUGGESTIONS FOR CARRYING OUT THE OCCUPATIONS IN CONNECTION WITH THE CORRELATED SCHEME OF WORK FOR AN INFANTS' SCHOOL.

June, Week I.

Clay Modelling.—This makes a most effective model, and it is not difficult. It has frequently been attempted, though, of course, not with great finish, in the baby room. First make the sphere and roll it out; then, by working with the fingers, obtain the shape of the pea-pod. Roll a tiny ball, press out and form five points to represent the calyx; place this at the upper end of the pod, and into it insert a stalk as shown in the illustration. Proceed in a similar way for the *open* pea-pod, but in this case you must form two sides, both hollowed out. Fasten these together along one side, and roll tiny balls for the peas and place them inside. You are advised to model the closed pea-pod first, and to take the open one as a second practice. In each instance you will, of course, make the model from the natural specimen.

Brush Painting.—This should be done by the free use of the brush; there is delicate work in it—the painting of the calyx and tendrils, for example. Sap green will answer for the pods and peas. A very pale brown for the calyx and tendrils will look best, as by the time the fruit is ripe both of these are turning colour.

Crayon Work.—Colour this if possible from a natural specimen. Pink or red or violet will be quite suitable, with green for the leaves, fruit, and stems. Reproduce by means of a copier. Make a large drawing on the blackboard, and demonstrate carefully the filling-in process.

WEEK I.—CLAY MODELLING: OPEN PEA-POD.

WEEK I.—BRUSH PAINTING: PEA-PODS.

WEEK I.—CRAYON WORK: SWEET PEA AND POD.

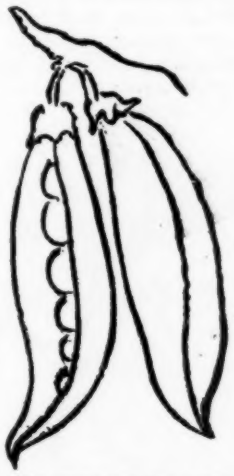
Paper Cutting.—Have this drawn first and then cut out. It has frequently been very well done by six-year-old children. The tendrils have not been introduced into this exercise, as they are scarcely possible in cutting out.

Blackboard Drawing.—Make a finished drawing of this first yourself, and then lead the children to notice any special points. Is it necessary to emphasise the importance of drawing direct from the object? If you cannot give a specimen to each child, at least draw from it yourself, and pass it round the class for observation. Ask yourself, How can I make this

exercise a help towards the power of expression? Every lesson should help the child more and more, both in the technical skill required in actual line

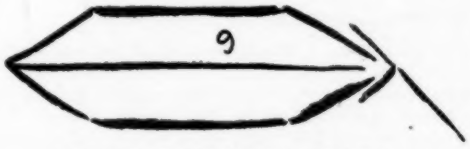
WEEK I.—PAPER CUTTING: PEA-PODS.

drawing, and also in the power of expressing his own ideas through graphic representations.



WEEK I.—BLACKBOARD DRAWING: PEAS.

Stick Laying.—Four sizes of sticks are required for this, should you wish the whole picture to be made with sticks. The calyx and stalk can easily be added



WEEK I.—STICK LAYING: PEA-POD.

afterwards with chalk on the desk, and would be more effective, being somewhat diminutive for reproducing by means of sticks.

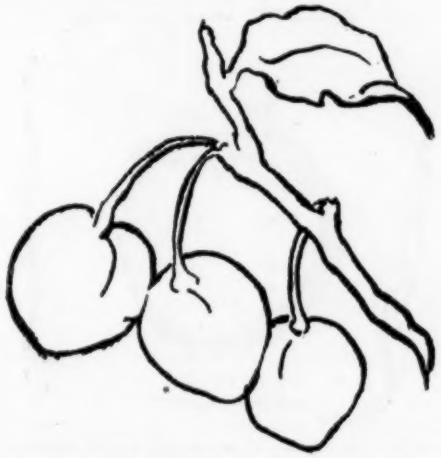
June, Week II.

Clay Modelling.—Perhaps there is no more interesting subject for a modelling lesson than this. The general shape is easy, it is effective, it may be finished to a degree of nicety not always possible, it is exceedingly realistic. First make several small balls the required size. If the children should not discover,

WEEK II.—CLAY MODELLING: CHERRIES.

WEEK II.—BRUSH PAINTING: CHERRIES.

while examining the specimen, that the cherry is not perfectly round, draw their attention to this fact.



WEEK II.—CRAYON WORK: CHERRIES ON SPRAY.

Proceed to shape it with the fingers. With one finger depress a spot at the top, in this depression make a

hole with a pointed instrument, and in that insert the stalk. Either the natural cherry stalk, or some string of about the same thickness—the natural stalk pre-

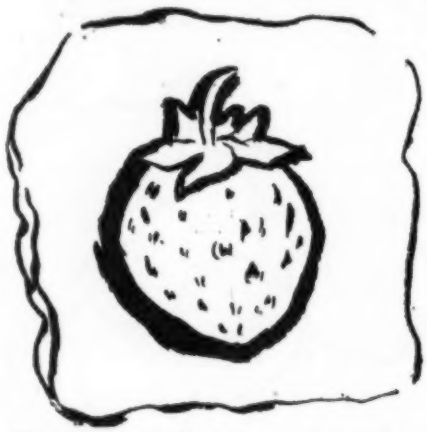
WEEK II.—PAPER CUTTING: CHERRIES.

WEEK II.—BLACKBOARD DRAWING: PARTS OF THE CHERRY.

ferably — answers best; if made with clay they require much care, and are not often successful.

WEEK II.—STICK LAYING: TREE.

Brush Painting. — This is chiefly a piece of mass painting. Vermilion with crimson lake gives a good



WEEK III.—CLAY MODELLING: STRAWBERRY.

red. You will need brown for the stem and green for the leaf. If three colours are impossible, let the stem be painted green. Paint the stem first, and then the cherry stalks. Leave some spots of white on the cherries, it will very much improve the appearance. Leave also a line of white down the centre of the leaf.

Crayon Work.—This does not call for any special remark, since many similar copies have been described. Brown, red, and green are the colours required. It should prove an attractive exercise.

WEEK III.—BRUSH PAINTING: STRAWBERRIES.

Paper Cutting.—This will not be difficult to children who have had some practice in the use of the scissors. It should be drawn first. A single cherry may be cut from a piece of paper folded in half, but the stalk appears too stiff, so that it is more successful to proceed according to the illustration.

Blackboard Drawing.—After a nature lesson on the cherry this will probably seem a most suitable exercise.

WEEK III.—CRAYON WORK: STRAWBERRIES ON PLANT.

Have it drawn large, and make constant reference to the points dwelt upon in the nature lesson. The thickened end of the stalk may be specially noticed, and likewise the insertion of the stalk actually upon the stone. The stalk and stone are often seen joined in this way after the fruit has been entirely eaten by the birds.

Stick Laying.—An exercise like this has its use if it affords means for conversation and language exercises. The tree represented is of course one trained against a wall. Not more than two lengths of sticks are required.

June, Week III.

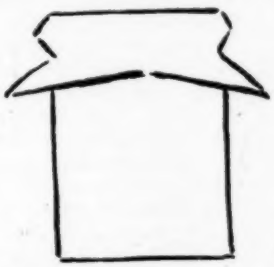
Clay Modelling. — To model the strawberry, first make a sphere; then, carefully copying the natural specimen, obtain the shape of the strawberry by gentle pressure with the hands here and there. Choose, if

WEEK III.—PAPER CUTTING: STRAWBERRY LEAF.

possible, a typically shaped strawberry—such as that shown in the illustration—from which to make the first attempt in modelling, the great variety in the shapes may be noticed afterwards. When the shape has been modelled, take a small piece of clay and

WEEK III.—BLACKBOARD DRAWING: STRAWBERRIES.

flatten it between the hands, keeping it of a circular shape. On this piece work up five points to appear like a five-pointed star. Place this in position for the calyx. In the centre of it make a small hole, into which insert a fine stalk. With a pointed instrument



WEEK III.—STICK LAYING: JAM POT.

make some marks upon the surface of the clay to represent the seeds on the outside of the fruit.

Brush Painting. — For this, use vermilion with a touch of crimson lake, and sap green. Paint the strawberry first by drawing the outline with the point of the brush, and then quickly washing in the colour. It will be necessary to allow this to dry before adding the calyx and the stalks in green; also when dry, with the point of the brush dipped in yellow or brown paint, add some specks for the seeds.

Crayon Work.—Reproduce this by means of a copier, and let each child have one. The colours required are red, green, and brown or yellow. Have a good-sized

WEEK IV.—CLAY MODELLING: SPRAY OF CURRANTS

drawing on the blackboard. This copy would be quite suitable for six-year-old children to draw themselves and then fill in with colour.

Paper Cutting.—Let the children draw this first and then cut out. It is easily cut also from a piece of paper folded in half. If this is done, make a good diagram on the blackboard.

Blackboard Drawing.—Let these be drawn sufficiently

WEEK IV.—BRUSH PAINTING: CURRANTS.

large. An opportunity occurs for specially noticing the calyx, which usually has ten points—that is, a double row of five. In the clay modelling exercise only half this number were represented, as ten would be rather too involved for making in clay.

Stick Laying.—Three sizes of sticks will be sufficient for this. Have some conversation to introduce a connection with the lesson on the strawberry and the object for illustration.

June, Week IV.

Clay Modelling.—You are advised to have a slab made on which to place this. First roll a piece of clay in the hands for the stalk, making it thickest at the upper part. Then, in imitation of a bunch of currants,

WEEK IV.—CRAYON WORK: CURRANTS ON SPRAY.

roll small balls of clay and put them on tiny stalks to attach to the stem. The currants, it will be seen, become smaller the nearer they are to the end of the stalk. Except that deftness and speed are

WEEK IV.—PAPER CUTTING: CURRANT LEAF.

WEEK IV.—BLACKBOARD DRAWING: SAME SPRAY AS THAT FOR CRAYON WORK.

required for this, there is not any difficulty in modelling it.

Brush Painting.—Vermilion and brown are the colours required. Paint the stalks first, and of course paint from a natural specimen. Be careful that the stalk is not made to look perfectly straight. In painting the currants have a spot of white left in each one, and see that the currants are smallest towards the end of the stalk.

Crayon Work.—The colours needed for this are red, green, and brown—the latter for the thick stalks—while the thinner ones are best coloured green. In filling in for the currants a circular kind of movement, beginning at the centre, is best.

Paper Cutting.—This is a very good exercise, both in drawing and cutting out. It would be well if the drawing lesson preceded the paper cutting. It is not

WEEK IV.—STICK LAYING: CURRANT LEAF.

suitable for cutting out from a folded piece of paper, as it is not symmetrical enough.

Blackboard Drawing.—The spray given for the crayon work exercise is quite suitable for a drawing lesson. It will be well to call attention to the particular growth of the currants on the branch.

Stick Laying.—This may be done with two lengths of sticks. Let the children sort them into the different lengths. First draw the object to be laid with sticks on the blackboard, then demonstrate the stick-laying process, and let the children follow.

You will, of course, have some suitable conversation to connect the lesson with previous ones.

HOLIDAY COURSES ON THE CONTINENT FOR INSTRUCTION IN MODERN LANGUAGES.

THE Board of Education have just issued a list of twenty-four Holiday Courses which will be held on the Continent at different times during the present year, but mostly in the summer months. Six of the Courses are in Germany, viz. Creifswald, Jena, Königsberg, Marburg, Neuwied, and Salzburg; four in Switzerland, viz. Geneva, Lausanne, Neuchatel, and Basle; one in Spain, viz. Santander; and the rest are in France, viz. Besançon, Tours, Honfleur, Paris, Grenoble, Nancy, St.-Servan-St.-Malo, Villerville-sur-Mer, Boulogne, Caen, Bayeux, Lisieux and Dijon. The paper issued by the Board of Education gives the date of each Course, the fees, return fares from London, lowest cost of boarding, principal subjects of instruction, address of local secretary and other details of importance to intending students. Copies of the paper can be obtained free on application to the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, London, S.W.

Our Modern Language Section

FRENCH PRIZE COMPETITION.

RULES.

1. All translations should be **posted not later than June 8, 1905**, and addressed:—PRIZE EDITOR, Office of the *Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of Half a Guinea is offered for the best rendering into English of the following extract:—

L'Intellect pur vise à la Vérité, le Goût nous montre la Beauté et le Sens moral nous enseigne le Devoir. Il est vrai que le sens du milieu a d'intimes connexions avec les deux extrêmes, et il ne se sépare du sens moral que par une si légère différence qu'Aristote n'a pas hésité à ranger parmi les vertus quelques-unes de ses délicates opérations. Aussi, ce qui exaspère l'homme de goût dans le spectacle du vice, c'est sa difformité, sa disproportion. Le vice porte atteinte au juste et au vrai, révolte l'intellect et la conscience, mais, comme outrage à l'harmonie, comme dissonance, il blessera plus particulièrement certains esprits poétiques, et je ne crois pas qu'il soit scandalisant de considérer toute infraction à la morale, au beau moral, comme une espèce de faute contre le rhythme et la prosodie universels. C'est cet admirable, cet immortel instinct du Beau qui nous fait considérer la terre et ses spectacles comme un aperçu, comme une *correspondance* du Ciel. La soif insatiable de tout ce qui est au delà et que voile la vie, est la preuve la plus vivante de notre immortalité. C'est à la fois par la poésie et *à travers* la poésie, par et *à travers* la musique que l'âme entrevoit les splendeurs situées derrière le tombeau. Et, quand un poëme exquis amène les larmes au bord des yeux, ces larmes ne sont pas la preuve d'un excès de jouissance, elles sont bien plutôt le témoignage d'une mélancolie irritée, d'une postulation de nerfs, d'une nature exilée dans l'imparfait et qui voudrait s'emparer immédiatement, sur cette terre même, d'un paradis révélé.

THÉOPHILE GAUTIER.

RESULT OF THE MAY COMPETITION.

The prize is awarded to "Nella." Will "Nella" kindly forward name and address for publication?

First Class.—Antonia, Lemuel Gulliver, Shakspere, More determined, Stay-at-home, Candebec, Noremac, Anita, Conor, Cornet, Kitt, Agaznog, Tyro, Kettering, Mouscron, Aylwin, Neptune, Caen, Danella, Excelsior, Zodiac, Ivanhoe II., D.S.G., Jobb, C.E.M., S.A.G., Sweetbrier, Conway, Carpe diem, Jeannette, Rustica, La débutante, Baldur, Bracebridge, L'avare, Le Chevalier d'Artagnan, Patricée, Jolibois, Grimbarian, Nil desperandum, Chaos, Try again, Fleur-de-lys, Buzfuz, Pas souvent, La timidité, C.E.W., Erica, Mr. Micawber, Trente-et-un, Snowdrop, Nomad, Sib, Mai, Sinna, Georgina, Sexeian, L'Ecosse.

Second Class.—Thomason, Clip, Paysan, Ernestine, Corona, Bessie, Stonehaven, L'été, The Choctaw, Gabrielle, Pump, E.M.B., Odd no., Cinq Mars, Claremont, Monavista, La Sentinelle, Kiltie, Jocelyn, Teazle, Philomel, Nancy, Goodshaw, Forget-me-nots, Panama, Cœur-de-lion.

The name and address of "Tencico," who won the April prize, are: Mr. Alfred Brammall, Providence Place, Tottington, Bury.

Report.

There is not a large number of really good papers this month, and even the prize-winner's rendering of the last phrase is inelegant. In fact, the amount of bad and doubtful English in the present batch of papers is rather a striking feature. "Poncis," in the sense of a conventional drawing, was rather difficult, and only a few seemed to know that *musée* means here a "picture gallery." *Genre*, too, was in many cases translated as "genius" and "people," by candidates who did not look closely into the spelling of the word.

Prize Translation.

Everybody paints well, says one; everybody writes good verses, says another. Granted, if by being a good painter, or a good poet, we are to understand avoiding the more glaring breaches of conventional usage, expressing oneself fluently in commonplace language, and understanding how to weave together skilfully and in accordance with known devices, stock phrases, and tricks of style. Everybody paints well because everybody has attended schools, has visited picture-galleries, and has the mind furnished with examples. But memory is cold, and does not excite the hand as imagination does. Our artists copy examples of Rubens, Rembrandt, Cuyp, &c. They surround themselves with engravings. Why, then, adding to all this a little taste, and the influence of their particular school, should they not succeed with the multitude. But examine a little more closely into the works of these clever painters, apply to them that method of criticism which results from the study of the great masters, and you will discover that they have neither unity, knowledge, sincerity, ideal, truth, nor skill in composition—nothing, in a word, which constitutes, not the great painter, but the painter. Everybody writes well because everybody knows how to read, and because, during the 300 years since the invention of printing, a considerable number of sentiments and shades of sentiment have been expressed by great writers. Is it not the very essence of scholastic and academic taste to borrow dignity of style from Bossuet, conciseness from La Bruyère, depth from Pascal, irony from Voltaire, passion from Rousseau, and so on? And thus it follows, that in consequence of expressing their own sentiments in the language of the masters, they come to think in terms of them, and, finally, to think at all no longer. "NELLA."

The increasing attention paid to the teaching of modern languages, in spite of indifference and obstacles, is shown by the appearance of *Modern Language Teaching*, a magazine published by Messrs. A. and C. Black, under the auspices of the Modern Language Association. We heartily commend the journal to the attention of all who are interested in modern language teaching.

TABLE OF HOLIDAY COURSES ON THE CONTINENT FOR INSTRUCTION IN MODERN LANGUAGES, 1905.

This Table has been prepared by the Special Inquiries Office of the Board of Education, and is circulated for the Information of Students and of Educational Authorities.

THE PRINCIPAL FOREIGN HOLIDAY COURSES, 1905.

Where held.	Organisation responsible for the conduct of the Course.	Date.	Fees.	Return Fares from London, 1st Class Steamer, 2nd Class Railway.	Lowest Cost of "Pension" per Day.	For further information address:	Principal Subjects, &c.	Important Details.
GERMANY AND AUSTRIA:								
Greifswald	A Committee of University Professors.	July 10-29.	20 marks..... Conversation classes, 5-10 marks.	*Via Hook of Holland, £6, 4s. 4d. To Berlin— Via Flushing, £5, 1s. 8d. Via Hook of Holland, £4, 19s. 8d. Via Ostend, £6, 4s. 2d.	3 to 4 marks	Ferienkurse, Greifswald (Prof. Dr. Bernheim).	German, French, and English Languages, Literature. Methods of modern language teaching. Phonetics, Pedagogy, Hygiene, Natural Science, History, Arts, Psychology, Folk-lore.	For teachers of both sexes. Special conversation classes for foreigners, conducted on most modern methods. All lectures given by University teachers.
Jena.....	An International Committee of University Professors and others.	August 3-16 (conversation classes continue until August 24).	Entrance, 5 marks. Each course of 12 lectures, 10 marks. Conversation classes (18 lessons and six excursions), 30 marks.	*Via Hook of Holland, £5, 9s. 0d. To Weimar— Via Flushing, £5, 0s. 9d. Via Hook of Holland, £4, 18s. 9d.	3 to 4 marks	Frau Dr. Schnetger, Gartenstr. 2.	Pedagogy, Natural Science, History of Art, Mental and Moral Science, Religion, German Language and Literature. Classes in French and English. Education of defective children.	For teachers of both sexes, renowned for its course of Pedagogy. Conversation classes (elementary and advanced) for foreigners.
Königsberg	A Committee of University Professors and others.	(Date not yet fixed).	15 marks.....	To Berlin, as above	3 to 4 marks	Ferienkurse, Königsberg.	History and Philosophy of Religion, German Literature and Art, French and English Language, Literature, Phonetics.	Special Language courses for foreigners.
Marburg ..	A Committee of University Professors and others.	1st Course, July 10-29; 2nd Course, August 6-26.	40 marks for each course, or for both 60 marks.	Via Hook of Holland, £4, 3s. 5d. To Coblence— Via Flushing, £3, 14s. 10d. Via Hook of Holland, £3, 12s. 10d. Via Ostend, £4, 0s. 4d.	3 marks to 4 marks 50 pfennigs.	Herr A. C. Cocker, Villa Cranston; or W. G. Lipscomb, Esq., Grammar School, Bolton, Lancs.	Pedagogy; History of German Language, German Literature, Modern History, History of Art; Phonetics, German, English, French; English and French Literature; Modern Language Teaching according to the New Method.	For teachers of both sexes. Conversation classes (elementary and advanced) for foreigners; Special German courses for beginners. Preparatory Courses from Easter.
Neuwied ..	The Teachers' Guild of Great Britain and Ireland.	August 4-25.	42 marks.....	Via Hook of Holland, £3, 11s. 6d. Via Flushing, £3, 13s. 6d.	4 to 5 marks	General Secretary, Teachers' Guild, 74 Gower Street, London, W.C.	German Language and Literature, Political, Social, and Economic aspects of Germany.	For English-speaking teachers and others. Both sexes. To promote a knowledge of the language, customs, &c., among the students.
Salzburg ..	The Salzburg Local Committee for the University Vacation Courses.	September 1-15.	Registration, 1 krone; Membership, 5 kronen; Entrance Fee for a course of 3-6 hours, 2 kronen; of 8-10 hours, 4 kronen.	Via Hook of Holland, £7, 5s. To Munich— Via Flushing, £6, 10s. 4d. Munich to Salzburg, about 17s.	Apply to Verein für Fremdenverkehr, Salzburg.	The Secretary, Salzburg Local Committee for the University Vacation Courses.	Philosophy and History, Law, Natural Science, Linguistics and Literature.	For University Students and others. Lectures by University Professors, Excursions, Archæological, Geological, Technical, &c.
SWITZERLAND:								
Geneva....	Université de Genève.	July 17-August 28.	40 francs, and 6 francs for special conversation classes and correction of written work.	Via Calais, £6, 15s. 10d. Via Antwerp, £6, 17s. 11d. Via Dieppe, £5, 12s. 1d.	4 francs....	M. Bernard Bouvier, Administrateur du Séminaire et des cours de vacances de Français moderne à l'Université.	Classical and modern French Literature, French institutions, special classes for study of spoken language, rhetoric, style, syntax and methods of teaching.	Specially intended for teachers and advanced foreign students of both sexes. [For information regarding Boarding Houses, address: Comité de patronage des étudiants étrangers, à l'Université.]
Lausanne..	The Faculty of Letters at the University, Lausanne.	July 20-August 30.	40 francs.	Via Calais, £6, 7s. 2d. *Via Hook of Holland, £6, 14s. 4d. Via Dieppe, £5, 2s. 4d.	4 francs (possibly 3 francs 50 cents).	M. J. Bonnard, Avenue Davel 7, Lausanne.	Literature; Philology; Phonetics; special study of spoken language. Methods of teaching History.	For foreigners of both sexes.
Neuchâtel.	Séminaire de Français moderne pour étrangers, Académie de Neuchâtel. Faculté des Lettres.	1st course, July 17-August 12; 2nd course, August 14-September 9.	50 francs for each course, or for both 50 francs.	Via Calais, £6, 5s. 2d. *Via Hook of Holland, £6, 0s. 8d. Via Dieppe, £5, 0s. 6d.	4 francs....	M. P. Desseulavy, Académie de Neuchâtel.	General Study of French Language and Literature.	For foreigners of both sexes. Elementary and advanced courses.

Note.—Programmes of most of these courses may be seen at the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, London, S.W.

* Special Tourist Tickets, three days' notice required, no free registered luggage.

Where held.	Organisation responsible for the conduct of the Course.	Date.	Fees.	Return Fares from London, 1st Class Steamer, 2nd Class Railway.	Lowest Cost of "Pension" per Day.	For further information address:	Principal Subjects, &c.	Important Details.
SWITZERLAND—*continued.*								
Basle.....	The Basle Education Department.	July 17-29.	Entrance Fee, 5 francs. General courses, 10 francs; special courses (science and languages), 20 francs; a single special course, 10 francs	Via Hook of Holland, £5, 10s. 4d. Via Flushing, £5, 14s. 10d. Via Dieppe and Paris, £5, 7s. 11d.	4 francs....	Erziehungs-Kanzlei, Basle.	Pedagogy; Natural Science; German Literature and Phonetics; French Literature and Modern Language teaching; History and Geography.	For teachers of both sexes. Special German course for non-Germans.
SPAIN:								
Santander	The Teachers' Guild of Great Britain and Ireland.	August 5-26.	£2, 2s. if name is entered before July 1; otherwise £3, 5s.	London, Paris, Bordeaux, and Irun, £8.	4½-5 pesetas if engaged before end of May.	General Secretary, Teachers' Guild, 74 Gower Street, London, W.C.	Spanish Language and Literature. Political, social, and economic aspects of Spain.	For English-speaking teachers and others. Both sexes. To promote a knowledge of the language, customs, &c., among the students.
FRANCE:								
Besançon..	Comité de patronage des étudiants étrangers de l'Université de Besancon.	(a) Holiday Courses, July 10–October 15 (b) Other Courses during the year.	For Summer Courses— 30 francs 1 month 40 „ 2 months 50 „ 3 months	To Paris, via Dieppe, £1, 13s. 3d. (3rd class). Paris to Besançon (return) about 30 francs.	3 francs 50	Monsieur le Secrétaire de l'Université de Besançon, 30 Rue Mégevand.	French Language and Literature, Conversation, Composition, Pronunciation, Philology, Pedagogy, History, Geography, and Institutions of France.	Lectures on literary, commercial, and scientific subjects. Excursions. Medicinal springs.
Dijon	Comité de patronage des étudiants étrangers, under the supervision of Rector of the University.	(a) July 1-October 31. (Holiday Courses). (b) Other Courses during the whole year.	(a) 30 francs for first 6 weeks, and 10 francs for each subsequent fortnight, or 60 francs for the 4 months.	To Paris, via Dieppe, £1, 13s. 3d. (3rd Class). Paris to Dijon (return), 31 francs.	2 francs 50 ct. (Students' Co-operative Restaurant); 3 francs in a family.	Monsieur C. Cestre, 7 Rue Le Nôtre.	French Language and Literature. Phonetics and Conversation. Composition, History. Social, Political and Economic aspects of France.	Excursions, Examinations for University Certificates. Special Course in *Esperanto*, 4 hours instruction per day. The city is rich in artistic and historic curiosities.
Grenoble..	Comité de patronage des étudiants étrangers de l'Université de Grenoble.	(Holiday Courses). July 1–October 31 (4–5 hours per day). Other courses during the whole year.	40 francs for the first 6 weeks, and 10 for each subsequent fortnight, or 60 francs for the whole course.	To Paris, via Dieppe, £1, 13s. 3d. (3rd class). (Paris to Grenoble, £1, 5s.) Via Calais and Paris, £6, 19s. 1d.	4 to 5 francs (possibly 3 francs 50 cts.)	Monsieur Marcel Reymond, 4 Place de la Constitution, or A. A. Gordon, 128 George Street, Edinburgh.	Lectures in French Language and Literature for foreigners of both sexes. Elocution and Pronunciation. Special Professor of Phonetics and laboratory, with phonograph for practical instruction. Special lectures for Englishmen beginning the study of French. Preparation for University certificates. Examination at end of August and October.	Visits will be made to places of interest in the mountains of Dauphiny and Savoy. (Grande Chartreuse, Mont Blanc, la Meije, &c.) Performance of classical French tragedy in the open air. Roman Theatre at Orange.
Nancy.....	A University Board attached to the Faculty of Letters. (Comité de patronage des Cours pour les étrangers.)	(a) During the academic year. (b) Holiday Courses, July 1-October 31.	(a) 50 francs for the half year, 70 francs for the whole year. (b) 40 francs for the first month, 10 francs for each following month—maximum, 60 francs.	To Paris, via Dieppe, £1, 13s. 3d. (3rd class.) (Paris to Nancy and back, £2, 3s. 2nd class.)	3 to 5 francs	Monsieur Laurent, à l'Université. (Also Bureau gratuit de renseignments, 24 rue des Carmes.)	French Language, Grammar, Phonetics, &c. Modern France (literature, art, history, political economy, institutions, law).	Preparation for the examinations of the Alliance Française and University Certificates. Excursions to the Vosges and visits to industrial establishments.
Boulogne-sur-Mer..	Alliance Française, et Université de Lille.	August 1-30.	30 francs for each course (Elementary and advanced). Examination fee, 4s. Elementary and 8s. Advanced.	Via Folkestone, £1, 18s. 4d. (second class). Via Cie. Bennett, 11s. 6d.	£1, 10s. per week.	M. Bornecque, Université de Lille, rue Gauthier de Châtillon.	French Language and Literature. History of Art, Science, Pedagogy, Institutions, Phonetics, Grammar and Conversation.	For foreigners of both sexes. Classes (Elementary and advanced) conducted by the Professors of the Université de Lille and Collège Communal de Boulogne. Excursions. Examinations for Diplomas.
St. Servan St. Malo....	Alliance Française, Comité de Rennes, and the University of Rennes.	August 2-29.	£2 for the whole month; £1, 4s. for half the month (to or from August 15th), 16s. for ticket admitting to 12 lectures. Examination Fee, 8s.	Return tickets from Southampton to St. Malo, £1, 8s. first class, £1 second class. Available for one month by special arrangement. Not available for holders of 16s. tickets.	4 to 6 francs	M. Gohin, Professeur agrégé au Lycée de Rennes.	I. Higher Course: French political and social institutions, Literature and History. II. Elementary Course: Conversation, Grammar, Vocabulary, very easy essays.	For foreigners of both sexes. French debates. Excursions to Mont Saint Michel, Dinan, and Cancale, &c. Examinations for Diplomas.
Paris.....	Alliance Française.	1st course, July 1-31; 2nd course August 1-31.	100 francs admits to both courses; 55 francs to all the lectures of a single course. Each lecture 1 franc. Each conversation class 50 centimes.	Via Calais, £3, 12s. 10d. Via Dieppe, £2, 17s. 1d.	6 francs....	Monsieur le Secrétaire, l'Alliance Française, Boulevard St. Germain, 186.	Classical and modern French Language and Literature, Elocution and Pronunciation. Phonetics. Institutions and Arts of France.	Elementary and advanced courses. Special courses on history of French art and institutions. Conversation classes.
Paris.....	The International Guild.	July 2-29. August 1-28. September 1-28	75 francs for 1 month, 140 francs for 2 months and 200 francs for 3 months.	As above.....	6 francs....	The Secretary, Guilde Internationale, 6 rue de la Sorbonne.	French Language, Conversation, Composition, Lectures on French Language, Literature and Contemporary Life.	Visits to picture galleries and places of interest in or near Paris. Use of Reading Room at International Guild for Students.

Note—Programmes of most of these courses may be seen at the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, London, S.W.

Where held.	Organisation responsible for the conduct of the Course.	Date.	Fees.	Return Fares from London, 1st Class Steamer, 2nd Class Railway.	Lowest Cost of "Pension" per Day.	For further information address:	Principal Subjects, &c.	Important Details.
FRANCE *continued.*								
Paris.....	Université Hall.	Christmas and Easter Holidays.	Successive series of 8 lessons. 12 francs each series.	Via Calais, £3, 12s. 10d. Via Dieppe, £2, 17s. 1d.	6 francs....	Monsieur Louis-Jadot, Université Hall, Boulevard Saint Michel, 95.	Study of French in groups of three or four. Visits to places of interest in Paris; also Lectures on Literature, Art, educational and social life of Paris.	Preparatory to summer courses of the Alliance Française, and to the examination for the certificat d'études françaises de l'université de Paris.
Tours.....	The Teachers' Guild of Great Britain and Ireland.	August 4–25.	£2, 2s. if name is entered before July 1; otherwise £2, 5s.	(To Paris—via Dieppe—3rd class £1, 13s. 5d.). Paris to Tours, about 10s.).	6 francs....	General Secretary, Teachers' Guild, 74 Gower Street, London, W.C.	French Language, Literature, History, Political, Social and Economic aspects of France.	For English-speaking teachers and others. Both sexes. To promote a knowledge of the language, customs, &c., among the students.
Honfleur	As above.....	August 4–September 1. (i.e. 29 days, 5 days a week).	As above.....	London to Southampton and Havre and Honfleur, 1st £2, 1s. 8d.; 2nd £1, 11s. 8d.	6 francs....	As above.....	As above.....	As above.
Bayeux....	Bayeux Committee of the Alliance Française.	August 1–24.	£2, 2s.; which entitles the student to attend all the classes of any one of the Professors, all the evening lectures, and two series of the morning lectures.	London via Southampton and Havre to Caen. Return first class £2, 1s. 8d.; second class £1, 11s. 8d.; Caen to Bayeux, second class fare 1s. 8d. Or London, Southampton, Cherbourg, Bayeux.	4½ francs...	M. Godal, au Collège, Bayeux, or John A. Nichols, Stanley Mount, New Mills, Stockport. (Syllabus post free on application after April 1).	Phonetics. Conversation. Pronunciation. Modern Life in France. French Literature and History. Historical explanation of the rules of Syntax. Versification. French Theatre in the xix. century. Picturesque and historical Normandy.	For teachers of both sexes. The classes are divided into Elementary, Intermediate, and Advanced. Examination for Diplomas. Excursions. Tapisserie de la reine Mathilde.
Caen.....	A local Committee under the supervision of the Rector of the University.	Easter Holidays, July 3–29, August 1–30. Other courses during the whole year.	£1 for one week, £1, 12s. two, £2, 4s. three, or £3 for one month.	First class £2, 1s. 8d.; second class £1, 11s. 8d., via Southampton and Havre: second class £1, 10s., via Southampton and Cherbourg.	4 to 6 francs	M. Lebonois, 7, rue Neuve-Bourg-l'Abbé, or Walter Robins, Esq., Wanstead Cottage, New Wanstead. M. Finlayson, Burgh School, Girvan. F. Weisse, Hamar, Norway. Oberl. F. Gunther, Iserlohn, Germany. (Syllabus post free.)	Classes. Reading and conversation (Elementary and advanced). Grammar and Philology. Literature. Phonetics. Commercial Class. Classical Literature. Political and social aspects of France. Modern Literature. Written exercises. Special study of spoken language.	Lectures by well-known writers. Excursions. Scholarships for August course. Examinations for Diplomas. Special evening courses. Small conversation circles (5 to 10 students. A French review is sent free to students during the year.
Lisieux...	A local Committee of French teachers together with a member of the Conseil Départemental de l'Enseignement, and a delegate of the Alliance Française.	July 3–27. August 2–29. A private course during the whole year by M. Féquet.	£1, 13s..... (41 francs)	£1, 15s..... (second class) Via Southampton and Havre, or via Cherbourg, or via Newhaven, Dieppe and Rouen.	5 francs a day	M. Féquet, 12, rue de Rouen, Lisieux; or J. Cobb, Esq., Morar House, Beech Lanes, Birmingham.	French Language and Literature. Phonetics. Translation. Versification. The lyrical poetry of the xix. century. Contemporary fiction. The orators of the Revolution.	Small conversation circles of seven students. Excursions at very moderate expense to places of interest in the neighbourhood. Special evening lectures. Examinations for Diplomas.
Villerville-sur-Mer (near Trouville).	A special Committee of University Professors (mentioned in the Syllabus) and the "Alliance Française."	August 1–23.	£2, 5s.; Free Examinations. Free Franco-English Correspondence for a whole year.	£1 11s. 8d., via Southampton and Havre (second class).	5 francs....	Monsieur L. Bascan, Rue Caponière. Caen. (Syllabus post-free on application.)	Special Course on Phonetics. Conversation. Composition. Elocution. Reading. Translation. French methods of Teaching. French Life.	For foreigners of both sexes. Excursions. Examinations for Diplomas. Special preparation for the London B.A., 1905.

Note—Programmes of most of these courses may be seen at the Board of Education Library, St. Stephen's House, Cannon Row, Whitehall, London, S.W.

The foregoing Table of Holiday Courses for Instruction in Modern Languages is only intended to serve as a guide to students in their application for further details; the particulars given should in all cases be verified by direct communication with the secretaries, whose names and addresses will be found in the seventh vertical column.

The Secretaries will generally supply applicants with a list of *pensions*, &c., but the little handbook, "Holiday Resorts," issued by the Teachers' Guild,* will always be found useful and reliable. The excursions in connection with most of these courses are arranged as economically as possible, and afford excellent opportunities for acquiring useful and interesting information, as well as for practice in conversation.

No student should attend an *advanced* course who has not some knowledge of the spoken language in which the course will be delivered. And all who take part in the courses are strongly advised to avail themselves of opportunities of enjoying social intercourse with foreign students. Experience has shown that in many cases, through associating too exclusively with visitors of their own nationality, students have missed much of the advantage which they would otherwise have gained from the courses.

* 74 Gower Street, London (price 1s., per post 1s. 1d., to non-members).

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Late Principal of the Belvedere Pupil Teacher Centre, First on Scholarship List; Author of "Scholarship School Management," "Building of the British Empire," etc.

SCHOLARSHIP COURSE FOR DECEMBER 1905.

Sixth Month—June.

Work to be Prepared.

1. *Reading and Repetition.*—Continual oral practice before a competent critic is necessary. In addition to the oral reading a good deal of general reading is necessary, not only to relieve the mind from the monotony of study, but also to store up new ideas and expressions, which will always tell in the general style of composition.

2. *Teaching.—The Teaching of Writing.* Chap. vi.—*Scholarship School Management.*

This is the easiest of all school subjects to teach, and one where the results are instantly apparent and can be exactly estimated. The reason is quite clear: there are only some half-dozen elements to learn, their combinations are very simple, and comparatively little practice is needed. And yet, it must be admitted, that good writers are comparatively few; and this is the result of bad teaching, arising from ignorance of the very essentials of the exercise. These essentials are: (1) correct position of the hand; (2) correct position of the body; and (3) a *possible* style of writing. These are fully dealt with in the text-book. When children commence writing, it generally is with pointed pencil on slates, and as the hard point produces a good line whichever way the pencil is held, the position of the hand is neglected, with the result that when pen writing is introduced, a bad habit has been acquired which is very difficult to eradicate, for the pen must be held in one position only, viz., so that the two points press evenly upon the surface. The beauty of the curves in writing depends upon the rapidity and ease with which they are produced. In copybook writing the child is trained to laboriously copy the printed headline. He must, and in fact generally does, produce a fair imitation; but in ordinary writing, especially if a little pace is required, the style falls all to pieces. It is amusing, and at the same time most regrettable, to see students write their answers in one style and set a copy in a totally different one, thus tacitly admitting that their own writing is not good enough to ask a child to copy. Hence the continued existence of copybooks with printed headlines—a confession of the weakness of the present generation of teachers in the subject.

The style adopted should be one which does not necessitate the pen point being lifted from the paper with each letter. What is known as "Civil Service" writing is simply very legible well-formed writing which the Commissioners insist upon, and which they get. This is destitute of all unnecessary flourishes, and must be written at a good pace.

Differences will show themselves in different children, the varying muscular power of the fingers and wrist account for this; and, provided the writing is beautiful and legible, there is no necessity to make any endeavour to eradicate this individuality.

The position of the body is most important. It is very easy to assume an attitude which absolutely prohibits the possibility of good writing. If these points are attended to, writing should be a very popular subject in schools, and *good* writing the rule, and not, as it is now, the exception.

3. *Drawing.*—Two copies each week—one a photograph from a cast, and the other a sketch from Nature, such as a bunch of daffodils or narcissi, &c. The time spent in studying the original will enable the student to appreciate and translate properly the printed copy. Small drawings are useless; they must fairly fill a half-imperial drawing sheet.

I shall be pleased to give a little book prize for the best sketch of flowers (from Nature) sent in.

4. *Music.*—Tonic Sol-fa notation. The major and minor modes.

Having studied the staff notation, there should be very little difficulty in this. The minor mode commences with a minor third, and hence we may have two modes—Ray mode and Lah mode. The former is found in some old Scotch songs, but is practically not used. The Lah mode has three forms to its upper chord.

(1) The Ancient form was **l$_1$ t$_1$ d r m f s l** ascending; **l s f m r d t$_1$ l$_1$** descending. To this there is the objection that the last interval in the ascent, viz., **s – l** is a tone, and this does not satisfy the ear, which requires a smaller interval. To meet this the scale was written in the

(2) Chromatic form = **l$_1$ t$_1$ d r m f se l** ascending; **l se f m r d t$_1$ l$_1$** descending. This introduced a chromatic interval **f – se** (augmented second) which should not occur in a diatonic scale. To obviate this the sixth was raised a semi-tone, and so we got

(3) Modern form = **l$_1$ t$_1$ d r m bah se l** ascending; **l s f m r d t$_1$ l$_1$** descending. It is to be noted that **fah** sharp was not called **fe**, because this would suggest the bridge note to the first sharp remove, and also that in descending the shortened sixth and seventh are not needed.

There are then two forms for the seventh and two forms for the sixth notes in the minor mode.

se = Major Essential Seventh.
soh = Minor Occasional ,,
bah = Major Occasional Sixth.
fah = Minor Essential ,,

The following questions have been asked on this point:—

(1) Write the minor scale ascending, using the minor sixth and the major seventh, and again descending, using the minor seventh and minor sixth.

(2) Write the minor scale in three forms.

(3) Write the minor scale (Lah mode), using the major sixth and major seventh in ascending and the major seventh and minor sixth in descending.

(4.) Name the following relations of the minor or lah mode (*a*) dominant; (*b*) minor or essential sixth; (*c*) leading note or essential seventh; (*d*) super tonic.

(5.) State clearly the difference in intervals and mental effect between a major scale (Key D), and a minor scale (Key F, lah is D), having minor sixth and major seventh.

(6.) Work an ascending minor scale (lah mode), using the minor or essential sixth and the major or essential seventh, and mark with a slur the position of the semitones.

(7.) Which tetrachord of the minor scale (lah mode) never varies? Write the variable tetrachord in three forms, and state which is exactly like the upper tetrachord of the major scale.

5. *Penmanship.*—Write a page daily in the *Practical Teacher* Copy-Book, and use great care at all times. Study carefully what is said above on the subject of writing.

With reference to the competition of last month the results are very poor. The specimens submitted are stiff and laboured, and destitute of that grace and ease which makes beautiful writing. In many cases the writing is altogether different from the ordinary style.

6. *Composition.*—Write one or two essays each week on such subjects as:—

(*a*) The value of public parks in the neighbourhood of great cities.
(*b*) The Augustan age of English Literature.
(*c*) The rise of Japan.
(*d*) Magna Charta.
(*e*) Pleasure and perils of the sea.
(*f*) "The child is father of the man."
(*g*) Ambition.
(*h*) Write a short description of your native place.

Read up the subjects, if necessary, and make out an outline plan before commencing to write. Do not be satisfied even with your best. Read the essay aloud; this appeal to the ear will often reveal defects which were not recognised by the eye.

The following notes may be of assistance:—

(*a*) Point out the unnatural conditions of life which obtain in crowded cities—lack of fresh air, sunlight, and variety of prospect. "God made the country, but man made the town." Note the yearning which every city man feels for the quiet and calm of the country. Those who can afford it leave the city daily, others manage to do so for a few weeks in the year, but the great majority rarely are able. Hence the necessity of bringing the country to them as far as possible.

(*b*) The notes in last month's course will help in this essay. Note particularly the French influence, and especially the introspective character of much of the writing. "The proper study of mankind is man," says Pope, but there are many things in nature which afford much more interest and enjoyment.

(*c*) The geography will assist this, also the notes of last month.

(*d*) This subject should be a welcome one. First sketch the state of England—a tyrannical and unjust king, an ignorant barony, an oppressed people, and an indignant church. Show the forces which had been inimical to one another united against a common oppressor. There is no other nation which can show at that period such a charter of freedom, and there is much to think about in the circumstances which produced it and its after-effects. Although confirmed many times and as many times broken, it set the keynote of English liberty, it stated the conditions of life between ruler and ruled, and though centuries passed before its provisions were all in force, nevertheless it was the foundation-stone on which the present structure of liberty has been reared.

(*e*) Make this a pen picture—a beautiful day and calm sea—pleasures of the sea-side, sailing, fishing, bathing, &c., then a storm and its effects.

(*f*) Explain this paradox—the child in its tastes and habits indicates what its particular bent will be when it is a man. Not always true—characters sometimes change entirely—but many striking instances have given rise to the proverb. Some of these may be quoted — youthful musicians, painters, sculptors, engineers. It should also be noted that where a child has betrayed a great interest in a subject, the parents have purposely developed this faculty and thus proved the truth of the statement.

(*g*) Distinguish carefully between proper and improper ambition. The former should be a part of every one's nature—a desire to excel, to do better than others, to prove ability, to overcome obstacles, &c. But this eminently good quality may become equally bad by going too far, when fair means are dropped for foul, when the baser qualities are called in to assist in the struggle, and lying, treachery, cruelty, &c., are the agents used to secure a position which should be obtained by fair means.

(*h*) This is a common exercise and a very good one. It is not necessary to make out a list of streets, buildings, churches, chapels, factories, &c., but a pen picture should be drawn so that a stranger may get some clear idea of the surroundings, and general appearance of the place, as well as know what is going on in the daily life of the citizens.

Comparatively few essays were sent in last month—the subjects may have been a little off the ordinary lines, but that should be an incitement rather than a deterrent. I continue the offer of last month—a prize for the best essay on one of the subjects above.

7. *English.*—(1) Learn 15 roots and meanings each week.

(2) The chief writers of the eighteenth century.

3. *Henry V.* Act iii., Scenes 3, 4, and 5.

4. Prepare thoroughly the Essay on Innovations.

(5.) The Grammar of the Adverb.

Notes.—The rise of the newspaper. "Necessity is the mother of invention," and the modern newspaper is the response to the innate curiosity of man to know what is going on outside his own particular circle. This desire has increased with education; without it there is little. The average educated man would miss his morning paper badly; the negro of Africa has no desire for one at all.

Like most other institutions, the newspaper has been a thing of long growth; it did not leap, like Minerva, fully developed from the head of a Jove, but gradually through many centuries it grew as demanded. The Romans had their *Acta Diurna*, or daily proceedings, written and posted up by order of the Senate, but the newspaper proper first appeared as small news sheets in the fifteenth and sixteenth centuries. When Venice was engaged in fighting the Turks, and the other nations were interested in the struggles, any remarkable occurrence was printed on a small sheet and hawked through the streets to be sold for a *gazetta* (a small Venetian coin). Hence the term gazette. Similarly in England, during the reign of James I., news-sheets were printed and sold. The Civil War produced many of these. The first English regular paper was perhaps the *Weekly News* (1622), which purported to give an account of the Thirty Years' War, then raging.

The *English Mercurie*, dated 1558 and preserved in the British Museum, was looked upon as the oldest paper extant till it was proved in 1839 that it was a forgery printed about 1766.

The keen interest felt in the varying fortunes of the Civil War produced a number of papers, published more or less regularly—the hostile armies, in fact, carried a printing-press about with them in order to spread the news of their successes. In 1665 the *Oxford Gazette* appeared, which when the Court returned to London became the *London Gazette*. The difficulties of the early editor were great—(1) he had a very limited reading public to appeal to; and (2) news travelled so slowly that it was sometimes months before it reached England. For many years news-sheets were printed which gave a summary of what was passing at home and abroad, and half the sheet was left empty for the professional news letter-writers to fill in what items they could pick up from the chat of the coffee-houses. Few of these papers had a long life or an extensive circulation. In the time of Anne, when pamphleteering became a fine art, many journals made their appearance—

The Review, published by Defoe in 1704, at first twice, later three times a week.

The Tatler, published by Steele in 1709, published thrice weekly, which ran to 271 numbers.

The Spectator, published by Steele and Addison in 1711, published daily, which ran to 555 numbers.

The halfpenny stamp, imposed in 1712, killed off many papers.

The Guardian, by Steele, appeared in 1713, and ran through 175 numbers.

The Rambler and *The Idler* were produced by Dr. Johnson.

But papers of this character have but little resemblance to the modern paper; they consisted rather of moral disquisitions and essays on literary and social subjects, and appealed naturally to a limited circle of readers. It was not till the end of the eighteenth century, when the great war of the French Revolution commenced, that a genuine thirst for immediate knowledge began to evince itself, and when, at a later date, communication was improved (steamships, railways, telegraph), so that news was collected rapidly, papers increased in number. The nineteenth century saw an enormous increase in the number of papers and the size of their editions. This was due to several causes—development of cables, abolition of the newspaper tax, enormous improvement in the machinery for printing, and the compulsory education of the people.

(2) The chief writers of the eighteenth century should be tabulated—something known of their more important works. In poetry the most important point to notice is the gradual revolt from the somewhat artificial style of the Augustan age, both in thought and expression. Tired of the monotonous heroic couplet and still more so by the continual study of "man," writers began to express their ideas in whatever metre best suited them, and to find inspiration in the simplest of nature's works, "A Skylark," "Daffodils," "Mountain Daisy," &c. Wordsworth was the chief writer in this new style, and not only he, but Keats, Shelley, Byron, &c., were bitterly attacked by the orthodox critics, happily without success.

(3.) *Henry V.*, Scene 3, affords another example of what has been mentioned before — the somewhat bombastic talk on national affairs which would please a Tudor audience. But the king's prediction of the outrages which would follow on the storming of a town is absolutely true, not only for that period, but even till last century with British troops, and up to the present with some armies. The rage of conflict seems to awaken all the lower passions, and changes a man into a wild beast.

Scene 4 is in lighter vein, and is another proof of Shakespeare's many-sidedness.

Scene 5 presents a typical French view of England and its people, which is not yet altogether extinct. Our "climate, foggy, raw, and dull," is a perpetual source of attack by foreigners, although it is one where "one may live out of doors on a greater number of days than in any other country." The continual blue sky and mild weather is enervating—"'tis the cold grey weather breeds hardy Englishmen."

(4.) The Essay on Innovations, full as it is of sensible advice, is essentially English. We are as a race conservative and opposed to change. "What is settled by custom, though it be not good, yet at least is fit" may be taken as a national

motto, and thus we cling to many things which should be consigned to limbo. Look at our system of national education, our national coinage, weights, and measures. These are examples where a "froward retention of custom is a turbulent thing." Bacon, it must be remembered, was living on the eve of the great Revolution by the people against the order of state affairs in the country, and regarded with much misgiving the unmistakable signs of alteration. Admitting that change is sometimes necessary he was loth to admit what probably (judging by his New Atlantis) he really thought, that the whole machinery of government needed serious alteration and improvement. He doubtless feared, as men always do fear, that the change would be made rashly and without counting the cost. Hence his advice, *Festina lente*, hasten slowly, set about the change gradually—not recognising apparently that some changes can only come with convulsions and trouble. His advice might be that of a Grand Duke on the present state of Russia.

(5.) The Adverb. Be sure of a good classification and correct definitions. Note the following:

(1.) Relative adverbs, wherein (= in which); whereby (= by which), &c.

(2.) Adverbs may modify not only verbs, adverbs, and adjectives, but anything equivalent to either of these. Some grammars say that adverbs modify conjunctions, *e.g.* "Just when the sun was setting." "Just" is said to modify "when." But a little thought will show that the idea conveyed by the word "when" cannot be modified; the word *just* applies to the whole of the adverbial sentence.

(3.) Correct use of here, hither, hence; where, whither, whence; there, thither, thence.

(4.) The Adverbial Object. Go *home*. It weighs 3 *lbs*. He ran a *mile*.

(5.) *There* is an introductory adverb in such cases as—"There is a tide in the affairs of men," "There lived a king," &c. It is used when the verb precedes its subject.

(6.) *The* is an adverb in phrases like—"*The* more *the* merrier," &c.

(7.) Some adverbs have inflections for degree of comparison—soon, sooner, soonest; ill, worse, worst, &c.

8. *Geography.*—(*a*) Finish the revision of Asia.
(*b*) The Dominion of Canada.

For the general revision of Asia use the Test Questions (Meiklejohn and Holden), which contain all the questions set in Scholarship, Certificate, Oxford and Cambridge Locals, &c.

Canada.—The Dominion is a land of enormous possibilities, which are not sufficiently recognised. Since Louis XIV. dismissed the loss of Canada with a shrug of the shoulders at the trivial matter of a "few acres of snow," the popular idea has followed the same lines, and Canada is synonymous with some people for desolation and cold. But this is not so. That its area of 3¾ million square miles (nearly as large as Europe with a population of less than London), *does* contain many uninhabitable parts is true, but one might as well say that Europe is a desert because few people can live in the Tundras. With infinite variety of healthy climate, with enormous riches in mineral and vegetable products, Canada is only wanting capital and men to make it one of the most powerful countries on earth; and if some of the thousands who make their way from England to settle (eventually) in the slums of huge American and Australian cities would but listen to the call of nature, and reap some of the inestimable riches which she bestows on hard work, they would be far happier and healthier. Space prevents my mentioning a hundredth part of the attractions which exist, from the moose-haunted forest of New Brunswick to the pine-clad slopes of Columbia. The magnificent fisheries, the beautiful forests, the gleaming rivers and lakes, the rich, virgin soil of the great prairies, the mines of coal and copper, iron and graphite, the oil-wells, the ranches of Alberta, the orchards and vineyards of the south, the forests and fur-bearing animals of the north, offer the colonist a bewildering choice of potential wealth, wealth to be obtained not by company promotion, but by direct application to the great Mother. To the lazy, Canada is no use; to the hard worker she gives better returns than he could get in the majority of other places. I know of a family—the father and five or six sons (the former well over the three score years and ten)—who, tired of endeavouring to obtain a living from the granite hills of Aberdeenshire, moved to Canada. Financially they find a vast improvement, and the lightness of their work (after the toil in Scotland) is a source of continual astonishment.

No doubt the isolation of the various provinces at first prevented much development, but since the Canadian Pacific Railway branch lines have been constructed much of this has been removed, and the whole country is becoming a harmonious and homogeneous whole.

By the British North America Act of 1867, Ontario, Quebec, Nova Scotia, New Brunswick were united in Government under the title of the Dominion of Canada. Manitoba joined the Federation in 1870, Columbia in 1871, Prince Edward Island in 1873, and to-day Newfoundland is the only part which remains a separate colony. The Central Government meets at Ottawa and consists of (1) The Governor-General; (2) the Senate of 81 members, representing the provinces in proportion to their population, appointed for life by the Crown; (3) House of Commons, 213 members, elected by the various constituencies. In addition to this each province has a separate legislation of its own. The following table shows the chief points in connection with each:—

NAME.	AREA.	POPULATION.	PRODUCTIONS.	TOWNS.	HISTORICAL NOTE.
1. Ontario . . .	222,000	2,167,978	Wheat, barley, oats, and other cereals; vegetables, dairy produce, timber, wool.	Toronto, Hamilton, Ottawa, London, Kingston, Guelph, Brantford, St. Thomas, Windsor.	Ceded 1763. Responsible Government 1848.
2. Quebec . . .	346,928	1,620,974	Lumber (and wood pulp), general farm produce.	Quebec, Montreal, Three Rivers, Hull, Sherbrooke, Hyacinthe.	Ceded 1763. Responsible Government 1848.
3. Nova Scotia with Cape Breton I.	20,600	459,116	Farm produce, timber, hay, coal, iron, fish, &c.	Halifax, Dartmouth, Sidney, Yarmouth.	Ceded 1713. Representative Government 1758.
4. New Brunswick.	28,200	321,263	Forest and fisheries, coal, silver, lead, antimony.	Fredericton, St. John, Monckton.	Colonised 1761 and 1783. Made Province 1784.
5. Manitoba . . .	116,021	254,347	Wheat and other cereals.	Winnipeg, Portage la Prairie, Brandon.	Made Province 1870.
6. Prince Edward Island.	2,000	103,259	Agricultural produce.	Charlottetown, Summerside, Georgetown.	Created a Province.
7. British Columbia.	400,000	178,000	Coal, timber, fisheries (salmon, &c.), farm produce.	Victoria, Vancouver City, New Westminster, Nanaimo, Rosslaw, Nelson.	Admitted 1871 to Dominion.
N.-W. TERRITORIES.					
8. Assiniboia . .	89,000	145,000	150,000 square miles are suitable for stock-raising and agriculture. Iron, gold (Yukon), and coal are found.	Regina.	Formed 1882.
9. Alberta . . .	106,000				
10. Saskatchewan .	107,000				
11. Athabasca . .	265,000	75,000			Formed 1895.
12. Ungava . . .	...				
13. Franklin . . .	...				
14. Yukon . . .	...				
15. Mackenzie . .	...				

Students will find a large amount of interesting reading in the hand-books given away by the Government of the various colonies.

9. *History.*—Henry III. and Edward I.

The reign of Henry III. falls into three periods—(*a*) the minority; (*b*) the period of personal rule; (*c*) the supremacy of the barons. During the minority the country was well governed by Hubert de Burgh, the last of the great Justiciars. On his fall in 1232 his place was taken by Peter des Roches, Bishop of Winchester, but the barons removed him in the following year. The personal rule of the king was marked by extravagant expenditure. The king showered wealth and honours on his wife's relatives, and accepted the kingdom of Sicily for his son, the Pope undertaking to conquer it and send in the bill for so doing; but when the bill came the country was still unconquered, and the barons determined to take matters into their own hands. Hence the Mad Parliament and the Provisions of Oxford. The matters in dispute were referred to the arbitration of the French king, who at the Congress of Amiens gave a verdict entirely in favour of the king. This caused open war.

The most interesting feature of the struggle was the summoning of parliament in 1265, with representatives of the towns. The members of the Norman Magnum Concilium consisted of all those who held lands directly from the king, but as the smaller barons soon ceased to attend or to be expected to attend, the power was gradually left in the hands of the greater barons and clergy. De Montfort's parliament consisted of (1) twenty-three barons, (2) 120 ecclesiastics, (3) two knights from each shire (this was simply restoring a privilege that had been allowed to lapse), (4) *two burgesses from each town.* This last was a distinct innovation, for the commons had never had any voice in the national council. It is doubtful whether De Montfort himself saw the magnitude of his action, but whether he did or not he certainly laid the foundation of the English House of Commons. At first all the members sat together, and it was not till thirty years later that the separate houses were established. When that took place, another incident of tremendous importance occurred. The knights of the shire entitled by birth to sit with the Lords went with the burgesses, and so the gulf between the commons and lords was bridged over. From the union of the wealthy merchant classes and the country gentry sprang that great English middle class which has ever since ruled England.

Edward I.—The policy of Edward was twofold: (1) To unite the whole of the island under one king; (2) to place the legislature upon a better basis.

In pursuance of the former (*a*) Wales was invaded, conquered, and incorporated by the Statute of Wales, 1284; (*b*) the affairs in Scotland gave Edward the chance he sought to establish his authority there. A table of the claimants must be prepared. Note that the point submitted to Edward for decision was whether primogeniture or proximity of relationship were the better claim. Bruce, descended from the second daughter of the Earl of Huntingdon, was one degree nearer than John Baliol, who was descended from the first.

The legal reforms are many and important—

1275. First Statute of Westminster provided for freedom of election and limitation of feudal aids.
1278. *Quo warranto* inquest, to inquire into the manner in which the barons had acquired the land they held.
1279. *Statute of Mortmain* (De Religiosis), a blow at the growing power of the Church. The lands left to the clerical bodies deprived the king of a substantial part of his revenue.
1285. Second *Statute of Westminster* (De Donis), instituting the law of entail, by which fathers were prevented from ruining the prospects of their heirs.
1285. *Statute of Winchester*, making many police reforms, instituting constables, and Justices of the Peace.
1285. *Circumspecta Agatis*, limiting the jurisdiction of spiritual courts to matters which were merely spiritual.
1290. *Quia Emptores*, by which, if a vassal parted with lands, the new owner did homage to the original superior. This prevented subinfeudation, which was becoming excessive. Indirectly it also facilitated the transfer of land from one owner to another.
1297. *De Tallagio non concedendo*, a declaration by the barons, agreed to by the king, that he had no right to collect toll taxes or aids without the consent of the Parliament.

In addition to these important statutes, the law courts were re-organised and a distinct staff of judges appointed to each. The High Court was divided into—

(1) Court of Exchequer, dealing with matters concerning the royal revenue.
(2) Court of Common Pleas, dealing with matters between private persons.
(3) Court of King's Bench, dealing with matters between sovereign and people.

10. *Arithmetic, Commission, Brokerage, and Insurance.*—Note particularly p. 236 on Covered Insurance. Work the examples given in the text-book.

11. *Algebra.*—Quadratic Equations. The theory of this is important. Students must be able to solve by factors, by completing the square, or by the formula.

If $ax^2 + bx + c = 0$ be taken as the general form of a quadratic, then $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$. This is the simplest way of solving. Take care to reduce the equation to the above form. You must also be prepared to prove simple theorems, *e.g.* that a quadratic cannot have more than two roots. Note also that there are as many values for x as the highest power, *e.g.* with x^4 occurring there are *four* roots.

Solve $x^3 - 1 = 0$. The solution would be apparently $x^3 = 1$ $\therefore x = 1$. But this only gives *one* value instead of *three*. By factors $(x - 1)(x^2 + x + 1) = 0$.

$$\therefore x - 1 = 0 \text{ and } x = 1,$$

and by formula $x = \frac{-1 \pm \sqrt{-3}}{2}$. These are the three values.

Work the following problems:—

(1) At a cricket match the contractor provided dinner for twenty-four persons and fixed the price so as to gain 12½ per cent. upon his outlay. Three of the cricketers were absent. The remaining twenty-one paid the fixed price, and the contractor lost 1s. What was the charge for the dinner?

Ans. 3s.

(2) A can do a piece of work in 30 days which B can do in 20 days. A began the work, but after a time B took his place, and the whole work was finished in 25 days from the beginning. How long did A work? Ans. 15 days.

(3) How many men are there in a regiment which can be drawn up in 2 hollow squares with the men 3 and 5 deep respectively, if the one square will just fall within the other, and the same number of men be in each square? Ans. 480.

(4) How much are eggs a score when a rise of 20 per cent. in the price would make a difference of 80 in the number which could be bought for a sovereign? Ans. 10d. a score.

Women.—Exercises on the first four rules. Work the following test:—

(1.) If $a=5$, $b=3$, $c=1$, find the values of

(i) $\frac{a^3 - b^3}{a^3 + ab + b^3} + \frac{2a + 5b}{2b - c} + \frac{a^3 - c^3}{a + 2b + c}$.

(ii) $\sqrt{5ab^2} + \sqrt[3]{9bc} - 2\sqrt[4]{3a + b - 2c}$. Ans. 9, 14.

(2.) Add together

$$3a^3 + a^2b - 2ab^2 + b^3,\ 3ab^2 - 2a^2b + a^3,\ a^2b - ab^2 + 3b^3,$$

and subtract half the sum from $3a^3 + a^2b^2 + 3b^3$.

Ans. $4a^3 + 4b^3$; $a^3 + a^2b^2 + b^3$.

(3.) Multiply $\frac{x^2}{2} - \frac{x}{3} + 1$ by $\frac{x^2}{3} + \frac{x}{2} - 1$, and square $x^2 + ax - 3a^2$.

Ans. $\begin{cases} \frac{x^4}{6} + \frac{5x^3}{36} - \frac{x^2}{3} + \frac{5x}{6} - 1. \\ x^4 + 4ax^3 - 2a^2x^2 - 12a^3x + 9a^4. \end{cases}$

(4.) Divide $a^2y^3 - b(a^2 + b)y + ab^3$ by $ay - b$,

and $\frac{3}{4}x^5 - 4x^4 + \frac{77}{8}x^3 - \frac{43}{4}x^2 - \frac{33}{4}x + 27$ by $\frac{x^2}{2} - x + 3$.

Ans. $\begin{cases} ay^2 - ab + by. \\ 3x^3 - 5x^2 + \frac{1}{4}x + 9. \end{cases}$

12. *Euclid*, Book I., Propositions 25–28, with 4 deductions each week.

Women.—Propositions 15–20.

13. *Science.*—Elementary chemistry. Mixtures and compounds. Water. Composition proved by Analysis and Synthesis. Physical properties of oxygen, nitrogen, hydrogen.

14. *Spelling.*—Learn 100 words per week from "Words Commonly Misspelt," Series C and D.

Test Questions.

English.—

(1.) Write a short life of Milton, and mention his chief works.

(2.) Write in your own words the substance of Bacon's essay on Travel.

(3. Analyse the following, and parse words in italics :—

That young men travel under *some* tutor, or grave servant, I allow *well*, *so that* he be *such* a one that hath the language and hath been in the country before, *whereby* he may be able to tell them *what* things are *worthy to be seen* in the country where they go.

(4.) Explain clearly how you would give a lesson on Voice to an upper standard.

Geography.—

(1.) Describe with a sketch map the courses of the Trans-Siberian and Trans-Caspian Railways.

(2.) Mention ten important towns in China, and give a few words about each.

(3.) How do you account for the difference between Japan and China in modern improvements?

(4.) Say what you can of Natal under these heads, (1) Surface, (2) Production, (3) Towns, (4) Government.

(5.) With what object were Chinese labourers imported into the Rand? Which of the South African Colonies would you prefer to go to, and why?

History.—

(1.) Explain clearly the points at issue between the King and Becket.

(2.) Point out what steps Henry II. took to reform the abuses of the preceding reign, and to strengthen the power of the Crown and of law.

(3.) Upon what occasions and with what results do you read of the Scots invading England?

(4.) Describe the circumstances which led to the Battle of Bouvines, and estimate its results.

(5.) Write a short essay on the importance of the Magna Charta.

Arithmetic.—Work the following paper :—

1. A rectangular tank, 9 ft. 7½ in. long, 2 ft. 8 in. deep, and 4 ft. $1\frac{1}{10}$ in. broad, has two pipes connected with it, one of which can supply 1080 cubic inches of water per minute, while the other can discharge the whole contents of the tank in 3½ hours. If the tank be empty and both pipes be simultaneously opened, how long will it take to fill it.

Ans. 14 hours.

2. Simplify—

$$\frac{(\frac{1}{2}+\frac{1}{3})(\frac{1}{3}+\frac{1}{4})}{(\frac{1}{2}-\frac{1}{3})(\frac{1}{3}-\frac{1}{4})}+\frac{(\frac{1}{2}+\frac{1}{3})(\frac{1}{3}+\frac{1}{4})}{(\frac{1}{2}-\frac{1}{3})(\frac{1}{3}-\frac{1}{4})}+\frac{(\frac{1}{2}+\frac{1}{3})(\frac{1}{4}+\frac{1}{5})}{(\frac{1}{4}-\frac{1}{5})(\frac{1}{4}-\frac{1}{5})}$$

Ans. 1.

3. A, B and C play at cricket. A's runs are to B's and B's are to C's as 3 : 2. They get 342 runs. How many did each get. Ans. 162 : 108 : 72.

4. A grocer buys 3½ cwts. of tea at £13, 16s. per cwt., and 4 cwt. at £12, 12s. per cwt., he mixes them and sells 7 cwt. at 2s. 9d. per lb. At what price must he sell the rest so as to gain 12½ per cent. on the whole cost. Ans. 1s. 1½d.

5. A reduction of 20 per cent. in the price of apples would enable a purchaser to obtain 120 more for a sovereign. What was the price before reduction. Ans. 2 a penny.

6. *Science.*—(1) How may it be proved (*a*) by decomposition; (*b*) by synthesis, that white light consists of seven colours.

(2) Draw a diagram of a solar spectrum. Mark in the position of the colours, the part of greatest heat and the part of greatest chemical activity. In what way can the composition of a substance be detected by the spectrum.

(3) Explain carefully the laws and principles of refraction.

PUPIL TEACHERS' COURSE

For Candidates' Examination, 1906.

Work to be Prepared.

1. *Reading and Recitation.*—Ten minutes' practice daily must be given to these subjects which are usually very weak. Silent reading will not do, oral reading before a competent critic is necessary. Attention must be paid to proper emphasis and modulation, the mechanical utterance of the words is only a small part of the exercise.

2. *English.*—(*a*) Learn 10 roots and meanings per week from the Pupil Teachers' English Note Book. (*b*) The grammar of the noun. Learn exact definitions of number, person, gender, case. Note the correct classification.

Nouns may be classified as { Concrete, / Abstract, } { Proper, / Common.

Note the various ways of forming the plural; nouns that have a double plural with the difference in meaning; nouns with no plural; nouns with no singular.

In the same way the various methods of forming the feminine gender must be noted. Learn also the list of nouns whose feminine forms is quite different.

In case, you must be able to define and illustrate the following :—

Nominative—	Possessive.	Objective—		
Simple.		Direct.	Cognate.	Adverbial.
Address.		Indirect.	Factitive.	Residual.
Apposition.				
Absolute.				

(*c*) *Marmion*—Prepare Canto 1. Read up the meanings of all allusions in the notes. Be prepared to parse and analyse any word or part. In reading through you will recognise at once the simple sentences which present no difficulty, and also those about which you felt some doubt. Give the latter your attention, and make up your mind how they should be analysed. If you cannot do this send the lines on a post-card, and they will be dealt with in the notes. You are strongly advised to do this regularly and systematically. If your grammar is weak, you will soon rapidly improve.

The following columns must be taken for analysis :—

(1) The sentence.

(2) The kind. Principal or subordinate; if the latter, whether adjectival, adverbal, or noun.

(3) The connecting word. (Note *when*, *where*, *how*, *why*, are never adverbs unless they introduce a question.)

(4) The subject.

(5) Enlargement of subject.

(6) Predicate.

(7) Extension of predicate.

(8) Object.

(9) Enlargement of object.

In parsing state (1) part of speech; (2) kind; (3) inflection if any; (4) syntactical relation (*i.e.* where it governs, qualifies), &c.

The following is a model analysis :—

Sentence.	Kind.	Con. Word.	Subject.	Enl. of Subject.	Predicate.	Exten. of Pred.	Object.	Enl. of Object.
1. Along the bridge Lord Marmion rode.	Simple.	...	Lord Marmion	...	rode	along the bridge (place)	...	...
2. Proudly his red roan charger trode.	Simple.	...	charger	his red roan	trode	proudly (man.)	...	...
3. Well by his visage you might know he was a stalwarth knight and keen.	Complex.	...	you	...	might know	well by his visage	he was ... ... keen	...
4. He was a stalwarth knight and keen.	Subord. Noun.	...	he	...	was a keen and stalwarth knight	...	...	...

(*d*) Work an essay each week on the following subjects:—
(1) The use of travelling.
(2) The Tower of London.
(3) Thrift.
(4) Emigration.

Read up the subject if necessary. Make out a skeleton plan before you commence to write; express your ideas in clear and simple language.

(3) *History.*—Saxon England.

Chief points:—The Saxons, who they were, whence they came, where they settled. The character of the invasion.

The nine kingdoms, and the stages by which they ultimately became three and then one.

The introduction of Christianity; (*a*) from the continent by Augustine; (*b*) from Scotland by the disciples of St. Columba.

The Danish invasions.

The reign of Alfred, and why he deserves the title Great.

Dunstan and his aims.

The reign of Edward the Confessor, and how it paved the way for the Conquest.

Saxon manners, customs, religion, &c.

The principal dates must be learned, and also lives of the chief men.

(4) *Geography.*—France, Spain, and Portugal. In preparing each country draw a large map, and insert the names of all places, &c., to be learned. Looking at an atlas is of little use any more than looking at a freehand copy would teach you how to draw. The test of knowledge in geography is the ability to draw a map from memory. Summarise the contents of your text-book into a note-book, and commit to memory, but guard against making notes too long. You do not want to transcribe your text-book. The industries, imports, exports, towns, and government, are of the greatest importance.

(5) *Arithmetic.*—G.C.M and L.C.M. Learn exact definitions of all terms. You must be prepared to find G.C.M. and L.C.M. by factors as well as by the usual methods. The problems set on G.C.M. and L.C.M. demand a clear knowledge of the theory, and without this you can hardly hope for success. Work through the examples given in the text-book, and send up any you cannot work (they may be numerous, if you do the exercise thoroughly). Some more solutions will be given next month.

(6) *Algebra.*—Work through the Exercises on Chapter II., Hall and Knight.

(7) *Geometry.—Euclid*, Book I., Propositions 1-4. Note the various parts of a proposition.
(*a*) General enunciation.
(*b*) Particular enunciation.
(*c*) Construction (if any).
(*d*) Proof.
(*e*) Conclusion.

Practical.—Construction of triangles and quadrilaterals from given data.

(8) *Music.*—The length of notes, the corresponding rest. Practise writing a piece doubling or halving the time.

(9) *Science.*—Measurement of volume by burette, pipette, or graduated cylinder. Your text-book will afford you plenty of exercise in this subject. The cost of the apparatus is very small, and all the experiments may be worked at home.

(10) *Spelling.*—If your spelling is weak you can find an excellent collection of words in "Words Commonly Misspelt," Series A, B, C, D. 1d. each.

Penmanship.—Regular daily practice should be taken in the Practical Teacher Copy Book. A good style is essential in all written exams.

Test Questions on last Month's Work.

1. Work as specimen of copy setting.
Longhand:—Autobiographically.
Shorthand:—Along the bridge Lord Marmion rode.

2. Define with examples, Adverb, Adjective, Preposition, and Conjunction.

What is wrong with the following:—"A verb is a word which tells you something about a noun."

3. Describe very briefly the substance of the poem "Marmion."

4. What difficulties did the Romans find in conquering England? What were their chief stations, and with what objects did they hold England?

5. Point out the effects of the Roman occupation—(*a*) on the people; (*b*) on the country.

6. Describe, with a diagram, the mountain systems of Europe.

7. Where and what are the following:—Bosphorus, Stromboli, Tundras, Lofodens, Iviça, Adige, Lombardy, Finisterre, Negropont.

8. Work the following:—
(1) When the number 582,167 is divided by a certain divisor, the quotient is 762, and the remainder is 761. Find the divisor. Ans. 763.
(2) Divide 6287647 by 121 by short division, and find the least number which added to 152, 181, 255 will make it exactly divisible by 3,854.
Ans. 51964 + 3; 1643.
(3) Multiply 1234568 by 4321089 in three lines.
Ans. 5,334,678,204,552.
(4) Reduce 6277237 sq. inches to acres, roods.
Ans. 1 ac. 3 yds. 4 ft. 133 in.
(5) What is a prime number? Resolve 132288 into its prime factors. Ans. $2^6.3.13.53$.

9. Write the signatures of the following scales, E, A♭, D, F♯.

10. An irregular oval is torn out of squared paper of uniform thickness. Explain clearly how you would find its area.

OUR CERTIFICATE COURSE FOR 1905.

BY GEORGE COLLAR, B.A., B.SC.,
Head-Master of Stockwell Pupil-Teacher School.

It is advisable for all candidates to go through a set of papers as much on the lines of the Government certificate papers as possible, and to pay special attention to the weak points that such a test points out. As the certificate examination begins this year on 3rd July, there will be no time for our readers to work such a set and do the revision work entailed if we leave the test papers till the July issue, and so we give them now.

These tests will be found to be of most value if worked as far as possible under the conditions of the certificate examination. No test books or notes should be referred to between the time of first seeing the questions and finishing the answers. Each paper should be worked at one sitting, and within the time allowed for it. Practice in writing the required particulars at the top of each paper will lead to a considerable saving of time in the examination itself. Read all the instructions carefully, noting how many questions you may attempt, which questions are compulsory, and the special methods, if any, you are required to adopt. You should then read through all the questions very carefully. If a choice is given you will then be able to select those you can answer best. But even if you have to answer all the questions, it is advisable to read them all carefully before beginning to answer any. You will then get a general idea of the lines on which the examiner wants the answers to run, and sometimes you can pick up bits of information or suggestions in one question which will help you to answer another; you can also discover which are the easiest questions, and unless you are told to answer the questions in the order in which they come it is advisable to begin with those you can answer best. In examinations candidates often begin with a difficult question, and spend so much time in ineffectual attempts to solve it that they have none left for questions that are easily within their powers. Whereas, if they had attempted the easy ones first, they would not only have some completed answers to show at the end of the examination, but the confidence arising from success in dealing with one question is a great help towards the successful handling of another.

THEORY OF TEACHING.

(Two and a half hours allowed. Answer eight questions.)

1. What registers are required in a Public Elementary School? Give rules for marking the daily register of a class of 40 scholars, of whom 20 are present in school, and 20 attending a manual training centre, or on an expedition allowed under Article 12 *g* (1) of the Code. What entries would you make on the register?

2. Draw up a Time Table—

Either for one day's work in a small country school, the staff of which consists of one certificated teacher and a teacher under Article 68, showing how you would distribute the work between them;

Or for one day's work of a class of 50 scholars who have attended a school for older children during three consecutive years;

Or for one day's work for a class of infants between the ages of 5 and 7.

3. Discuss the merits and disadvantages of the substitution of paper for slates throughout a school.

4. Discuss the theory that memory is strengthened by exercise. By what other means can we permanently assimilate knowledge?

5. What are the commonest defects in the penmanship of upper standard children, and how would you remedy them?

6. What records of progress should be kept by every teacher? Compose a specimen report of progress, during one month, of any class you may choose.

7. Describe briefly the best planned and most sanitary school building which you have visited.

8. How does nature study differ from a course of science? How would you deal with the former in a large town?

9. How would you judge of the merits of a lesson in physical exercises given to a class of 40 or 50 children in a Primary School. Mention some of the commonest faults in such lessons.

10. Draw up a syllabus and a record form for a month's work for Standard III.

11. What are the ideal ends of the teaching of Recitation? Indicate briefly the chief hindrances in the way of their attainment.

12. Compare the moral value of various forms of school rewards and punishments.

13. Draw up brief notes of a lesson on *one* of the following:—
(*a*) Subtraction of money.
(*b*) Division of fractions.
(*c*) Mensuration of a circle.

14. How far may the occupations of infants be continued and developed in the upper school? Illustrate this in connection with Brushwork and Clay-Modelling.

15. Give some simple rules for the heights of seats and desks suitable for children of different ages. Mention some common defects in school desks. Which is the best furniture for a babies' room where there is ample space?

16. How would you bring home to a class a general moral reflection? *e.g.* convince a class of scholars above the age of 12 that one should not speak evil of neighbours behind their backs.

English Language and Literature.

(Three hours allowed. Answer two questions from Section I. and one from each of the others.)

Section I. (*Richard II.*)

1. Describe the character of King Richard II. as represented in Shakespeare's play, pointing out and illustrating by references (*a*) its development, (*b*) its unity, and (*c*) the chief traits in it which are enforced by comparison with contrasted characters.

2. Why are there so few female characters in Shakespeare's plays? Sketch the female characters in *Richard II.*

3. Explain the allusions in the following passages:—
(*a*) Since last I went to France to fetch his queen (I. i. 131).
(*b*) My Lord, my answer is —— to Lancaster (II. iii. 70).
(*c*) Down, down, I come; like glistering Phæthon
Wanting the manage of unruly jades (III. iii. 178).
(*d*) Upon remainder of a dear account (I. i. 26).
(*e*) Ah, thou, the model where old Troy did stand (V. i. 11).

Section II. (Burke's *Thoughts*).

1. What was the "Double Cabinet," and what circumstances made its introduction possible? Give an outline of the arguments by which Burke proves that it is inconsistent with the spirit of the Constitution.

2. How did the Court Party manage to keep themselves from unpopularity, and what were the effects of their action on (1) the Executive Government; (2) the temper of the people; and (3) the interests of the Sovereign respectively.

Section III. (Scott's *Kenilworth*).

1. Describe briefly the part played in the story by *four* of the following persons:—Anthony Foster, Wayland Smith, Dickie Sludge, Will Badger, Nicholas Blount, Laurence Staples, and Master Mumblazen.

2. Give an account of *either* the journey of Amy Robsart from Cumnor to Kenilworth, *or* of the interview between Amy Robsart and Queen Elizabeth.

Section IV. (Sir Roger de Coverley).

1. Describe in your own words either Sir Roger at church or the Coverley Hunt.

2. Describe the relations between the various classes of society as depicted in the "Sir Roger de Coverley Papers."

Section V. (Thackeray's *Esmond*).

1. Describe the part played by Esmond in the important historical events of his time.

2. Write a description of the daily life at Castlewood Hall.

Section VI. (Golden Treasury of Songs and Lyrics).

1. Name the authors of *four* of the following extracts, and show, by quotation or description, that you are acquainted with the poems from which the extracts are taken. (You are not required to write notes on the extracts themselves.)

(1) Yet why?—a silvery current flows
With uncontrolled meanderings;
Nor have these eyes by greener hills
Been soothed, in all my wanderings.
And, through her depths, Saint Mary's Lake
Is visibly delighted;
For not a feature of those hills
Is in the mirror slighted.

(2) Ever let the Fancy roam;
Pleasure never is at home;
At a touch sweet Pleasure melteth,
Like to bubbles when rain pelteth.

(3) Mighty victor, mighty lord,
Low on his funeral couch he lies!
No pitying heart, no eye, afford
A tear to grace his obsequies.

(4) But, oh! the heavy change, now thou art gone,
Now thou art gone, and never must return!
Thee, Shepherd, thee the woods and desert caves
With wild thyme and the gadding vine o'ergrown,
And all their echoes mourn.

(5) Cupid and my Campaspé played
At cards for kisses; Cupid paid.

(6) Ring out, ye crystal spheres!
Once bless our human ears,
If ye have power to touch our senses so;
And let your silver chime
Move in melodious time;
And let the bass of heaven's deep organ blow;
And with your ninefold harmony
Make up full consort to the angelic symphony.

(7) O Solitude! where are the charms
That sages have seen in thy face?
Better dwell in the midst of alarms,
Than reign in this horrible place.

English History.

(Two hours allowed. Answer four questions, not more than one out of each section.)

Section I.

(1) What causes led Julius Cæsar to invade Britain, and what were the manners and customs of the people he found living in the island?

(2) Give an account of the invasions of the Danes, and say what permanent effects they have had.

(3) Give an account of the conflict between the power of the king and that of the barons between 1066 and 1485.

Section II.

1. State concisely (*a*) the causes and pretexts of the "Hundred Years' War"; (*b*) why, after slumbering for two reigns, it broke out afresh under Henry V.; (*c*) why the English were successful at first but eventually lost.

2. Name any members of the families of Dudley, Howard, and Seymour who attained prominence during the Tudor period, and give an outline of the political influence of each person named.

3. Write short notes on the following technical terms relating to the *ecclesiastical* constitution of England:—*Court of High Commission, Lollards, Praemunire, Puritans, Recusants.*

Section III.

1. (*a*) Name the events in Ireland from the flight of James II. to the Pacification of Limerick.
(*b*) What questions that had been in dispute between the King and Parliament were settled by the Bill of Rights?
(*c*) What did England gain by the Treaty of Utrecht? Mention a clause in that treaty which has led recently to difficulties with France.

2. Give an outline of the steps by which our Empire in India has been acquired and extended.

3. Give an account of the origin of the following colonies:—Virginia, the New England Colonies, Maryland, New York, and Pennsylvania. What statesmen were most prominent in imposing or opposing the taxation of the American colonies, and what arguments were brought forward on both sides?

Section IV.

1. Compare the policy and statesmanship of the two Pitts. What was the policy of the younger towards Ireland?

2. What was meant by Napoleon's Continental System, and what measures did we adopt in retaliation? How did those measures bring us into conflict with the United States?

3. Give an outline of the naval struggle between Great Britain and France from 1790 to 1805, and describe in detail either the Battle of the Nile or the Battle of Trafalgar.

Geography.

(Two hours allowed. Answer six questions.)

1. Compare Great Britain with Japan under the following heads:—(*a*) Geographical position; (*b*) resources; (*c*) government and character of the people.

2. What are the most important influences affecting the climate of Manchester, Yarmouth, Berlin, Moscow?

3. Point out the geographical advantages of the situation of Milan, Brindisi, and Ulm.

4. With what geographical discoveries are the following names associated:—Stanley, Eyre, Magellan, Speke and Grant, Franklin, Cabot, Vasco di Gama, Cook.

5. Where and how are the following substances obtained:—India-rubber, indigo, jute, camphor, sago, nutmeg, isinglass, caviare? Give briefly the use of each.

6. Discuss the relative importance of Bristol and Liverpool both now and formerly.

7. Describe five of the chief British lines of steamships.

8. From which part of the world do we draw our supplies of raw cotton? In what ways is the supply unsatisfactory, and what efforts are being made to improve it?

9. Write an interesting fact about each of the following, and say with which country it is politically connected:—Greenland, Minorca, Mauritius, Pitcairn Island, and Java.

10. Give an account of Tasmania.

11. What is meant by the "entrepôt trade"? Give an account of the entrepôt trade of London.

12. Explain carefully the causes of the intense cold at the top of a high mountain. What is the "snow line," and why is it at different heights in different places?

Arithmetic.

(Three hours allowed. All questions may be answered.)

1. Show that in no sense of the word can the term "borrow" be used in subtraction. In what way can the teaching of subtraction of money be based upon simple subtraction?

2. Explain clearly how pounds may be reduced to quarters by successive divisions by 2 and 7. Make the rule for finding the remainder clear to children.

3. How would you teach the "Long Measure" table so as to bring it into association with the everyday use of the units named in it? How would you connect Square and Cubic Measure with Long Measure?

4. Work the following sums as shortly as possible, and, where necessary, add a note on the method you have followed:—

(*a*) Simplify— $\dfrac{(\frac{1}{2})^3+2\times\frac{1}{2}\times\frac{1}{3}+(\frac{1}{3})^2}{\frac{1}{2}+\frac{1}{3}}$.

(*b*) 4836×9999.

(*c*) $481{\cdot}5\div33{\cdot}\dot{3}$.

(*d*) Find the cost price of goods which are sold for £963 at a gain of 12½ per cent.

(*e*) Find the value of $\sqrt{(12{\cdot}18)^2-(12{\cdot}32)^2}$.

(*f*) 4125 articles at £8, 2s. 8d. per thousand.

5. Explain as to children what is meant by "square root, least common multiple, and recurring decimal."

Extract the square root of 7 to four places of decimals, and show that the exact square root of 7 can never be found.

6. At what time are the hands of a clock together between 5 and 6 o'clock?

7. Six men, A, B, C, D, E, F, agree with a seventh man G, to provide a sum of money among them. A, B, C, D, E, and F are to subscribe £10 each, and G is to provide £2 more than the average of the seven, what is the sum provided?

8. A can run 100 yards in 12·6 seconds, B in 12·4 seconds, C in 12·2 seconds, and D in 12 seconds. If A has 5 yards, B 3½ yards, and C 2 yards start, in what order will they finish? and when the first one reaches the winning post how far will the last one be behind him?

9. Find to the nearest penny the compound interest on £18,828, 17s. 6d. for 3 years at 3½ per cent.

10. Simplify, and give the result in a decimal form—

$$\frac{\cdot\dot{9}04761\times\cdot0476\dot{1}0\times\cdot\dot{4}76190}{\cdot761901\times6190\dot{4}7\times\cdot\dot{1}90466}.$$

11. A person sold £5175 stock from 3 per cents. at 92½, and invested the proceeds in 5 per cent. debentures at 103½. What was the increase in his income?

12. Find the value of a collection of 816 coins consisting entirely of shillings, florins, and crowns, if the value of the total number of shillings, of florins, and of crowns is the same.

Elementary Science.

(Three hours allowed. Not more than eight questions may be answered altogether, of which two at least must be taken from Section A.—(i.) Elementary Physiography.)

A.—(i.) Elementary Physiography.

1. Why do the hairs of a wet paint brush set close together, and what happens when the brush is immersed in water? Give other phenomena due to the same cause.

2. A cold water tank in a warm kitchen was observed to be giving off "steam." How do you explain this phenomenon, and how would this visible "steam" move?

3. What are the two constituents of water? Describe experiments by which each may be obtained in the free state.

4. Give a full list of the properties of pure water.

A.—(ii.) Advanced Physiography.

1. What is meant by the "kick" or "recoil" of a gun? Which law of motion does it illustrate? Mention any devices you know of for resisting the recoil, or for making it do useful work.

2. Illustrate by means of a diagram the path of the rays of light by which a man sees his image in a plane mirror, and show that in order to see the complete reflection of himself the mirror must be half the height of the man.

3. Describe the specific gravity bottle, and say how it may be used to find the specific gravity of a liquid such as alcohol, and of finely divided solids such as small shot.

4. How can you obtain carbon dioxide in a pure form, and what experiments could you work to show its properties?

5. Show that with the aid of a thermometer alone it is impossible to measure quantity of heat. What are the effects of heat on bodies, and which of those effects can be used in measuring heat?

B.—Elementary Biology.

1. Explain the terms—germination, etiolation, pollination, rhizome, and ovule.

2. What is meant by cross-fertilisation? Describe some arrangements in common plants by which this is brought about.

3. Where are the liver and the kidneys situated, and what are their respective functions?

4. Explain any three of the following terms, and give illustrations—parasite, protective coloration, symbiosis, natural selection, rudimentary organ.

5. Describe six special arrangements by which plants can distribute their seeds, and say why such arrangements are necessary.

C.—Domestic Science and Hygiene.

1. Name four common forms of exercise, and show which parts of the body they respectively benefit.

2. What are the respective advantages of woollen, cotton, and silk materials for clothing?

3. Give a short account of the chief processes now in use for preserving food on a large scale.

4. What is the cause of hardness in water, and how may the degree of hardness be measured? Describe two processes by which the hardness may be removed.

5. What are the chief ingredients in baking powder, and how do they act?

6. Explain the way in which some of the chief disinfectants act, and say what precautions should be taken in using them.

English Composition.

(One hour allowed. No candidate may omit this exercise.)

Write a short essay on *one* of the following subjects:—

(1) "For manners are not idle, but the fruit
Of loyal nature and of noble mind."

(2) "This above all: To thine own self be true;
And it must follow, as the night the day,
Thou canst not then be false to any man."

(3) The differences between prose and poetry.

GEOMETRY (Men only).

(Two hours allowed. Answer all the questions.)

1. Define a surface, a plane figure, a rectangle, a circle. If a circular sheet of paper be folded about a diameter, prove that the two flaps will exactly coincide.

2. What is meant by the "altitude of a triangle"? Prove that triangles on the same base and of equal altitudes are equal in area.

If ABCD be a parallelogram, and P any point in the diagonal AC, prove that the triangles PAB, PAD are equal in area.

3. Prove that the perpendiculars drawn from the three vertices of any triangle to the opposite sides are concurrent.

4. Describe a square equal in area to a given rectilinear figure.

A square and a rectangle are equal in area; prove from the figure of the above proposition that the perimeter of the square is less than the perimeter of the rectangle. By which other proposition could you prove that of all rectangles having the same perimeter the square is that which has the greatest area.

5. Prove that if a circle touches another internally the straight line which joins their centres, being produced, will pass through the point of contact.

If two circles meet at a point which lies in the straight line joining their centres, prove that they cannot meet in any other point.

6. In any circle (i.) the angle in a semicircle is a right angle, (ii.) the angle in a segment greater than a semicircle is less than a right angle, and (iii.) the angle in a segment less than a semicircle is greater than a right angle.

If BC is a common tangent of two circles which touch externally at point A, prove that the angle BAC is a right angle.

7. If an angle of a triangle be bisected internally, or externally, by a straight line which cuts the opposite side, or that side produced, the ratio of the segments of that side is equal to the ratio of the other sides of the triangle.

If ABC be a triangle in which the angle at A is a right angle, and if from A any two straight lines be drawn equally inclined to AB, meeting BC in D, and CB produced in E, show that

$$EC : CD = EB : BD.$$

8. Show that the ratio of the areas of two triangles upon the same base is equal to the ratio of their altitudes.

ALGEBRA (Men only).

(Two hours. Answer all the questions.)

1. Multiply the sum of $2x(x-1)-(x-4)$, $2x-3$, and x^2+1, by the remainder when $(x+1)(x-1)-(x+6)$ is subtracted from $(x-2)(x+2)+3(x-3)$.

2. Without doing the complete multiplication, give the term involving x^4 in the product of $x^5+3x^4-4x^3-2x+7$ and $2x^4-3x^3+4x-11$.

3. Enunciate the remainder theorem, and without actual division write down the remainder of the division of $3x^5+2x^4-5x^3+2x^2+11x-7$ by $x+3$.

4. If $x^4+3x^3+2x^2+Ax+B$ is divisible by x^2+2x+3, what is the value of A and B?

5. Find the value of—

$$\frac{15x^2-31xy+14y^2}{10x^2+xy-21y^2} \times \frac{21x^2-9xy}{3x^2-2xy+3x-2y} \div \frac{27x^2-63xy}{2x^2+3xy+2x+3y}$$

6. The majority against a certain motion is equal to 6¾ per cent. of the total number voting. If 12 of those who voted against the motion had voted for it, the motion would have been carried by a single vote. Find the numbers voting on each side.

7. If α and β be the roots of the equation $x^2-px+q=0$, form an equation whose roots are $m\alpha^2+n\beta^2$, and $m\beta^2+n\alpha^2$.

8. The journey between two towns by one route consists of 233 miles by rail, followed by 126 miles by sea; by another route it consists of 405 miles by rail, followed by 39 miles by sea. If the time occupied on the journey is 50 minutes longer by the first route than by the second, find the average speed by rail, assuming it to be the same on each route, and 25 miles an hour faster than the average speed by sea.

9. If $a:b=c:d$,

Prove that $\dfrac{a^2+ab+b^2}{a^2-ab+b^2}=\dfrac{c^2+cd+d^2}{c^2-cd+d^2}$.

10. Find the square root of—

(i.) $27+4\sqrt{35}$.

(ii.) $9x^4-42x^3+37x^2+28x+4$.

11. Solve the following equations:—

(i.) $\dfrac{a}{bx}+\dfrac{b}{ax}=a^2+b^2$.

(ii.) $(x-10)(x-7)+(2x-9)(x-8)=103$.

(iii.) $\begin{cases} x^2+xy=28 \\ xy+y^2=21 \end{cases}$

12. Simplify the expressions—

(i.) $\left(\dfrac{a^3}{b}-\dfrac{b^3}{a}\right)\left(\dfrac{3a+b}{a+b}-\dfrac{3a-b}{a-b}\right)$

(ii.) $\dfrac{1}{(a^2-b^2)(a^2-c^2)}+\dfrac{1}{(b^2-c^2)(b^2-a^2)}+\dfrac{1}{(c^2-a^2)(c^2-b^2)}$

BRITISH MUSEUM LANTERN SLIDES.

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2. He must be recommended in writing by a corporate body or institution, or by a person holding a responsible position, who shall certify that the borrower is a person to whom the slides may be entrusted.

3. He shall be answerable for the slides from the time that they shall come into his possession until they shall have been re-delivered, on return, at the British Museum; and he shall make good any loss arising from injury to the slides or packing-boxes during the same time.

4. The Trustees reserve to themselves entire freedom in granting and refusing applications.

The following groups of slides are available:—

	Slides.		Slides.
I. Assyrian Antiquities	25	X. Oriental Biblical Manuscripts	11
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CHEMISTRY.

(ADVANCED AND HONOURS.)

BY C. A. WEST, B.SC., A.R.C.S., F.I.C.

Strengths of Acids (*continued*).

Thomsen's Thermo-chemical Method.—Julius Thomsen, as far back as 1854, described his method of experimentally determining the relative distribution of one base between two acids. The principle of his method will be made clear by the following: Take a gram molecule of sulphuric acid and dissolve it in water, afterwards diluting until the strength of the solution is about ·25 molecular normal. Also take a gram molecule of soda and dilute similarly. Bring the two solutions to the same temperature and mix them (or equal portions of them) thoroughly and measure the rise in temperature, and from this and the weight of the solution calculate the amount of heat produced, assuming the specific heat of the solution to be unity. The amount will be found to be approximately 31,380 calories where the calorie is the quantity of heat required to raise the temperature of one gram of water one degree centigrade. Carry out a similar experiment with soda and hydrochloric acid, and the amount of heat evolved will be found to be approximately 27,480 calories. Thomsen further found, on adding one gram molecule of hydrochloric acid in dilute solution to one gram molecule of sodium sulphate in a similar solution, that 3360 calories were liberated. Now this could only be explained by supposing that the hydrochloric acid had acted chemically on the sodium sulphate. If the whole of the sodium had been taken from the sulphuric acid to form sodium chloride, the sulphuric acid we should have expected would have absorbed 31,380 calories, the amount of heat given out when the sulphuric acid first combined with the soda. At the same time we should have expected that the hydrochloric acid, on interacting and forming sodium chloride, would have given out 27,480 calories, and the nett result would have been the absorption of 31,380 – 27,480, or 3900 calories.

However, as already stated, Thomsen found that the heat absorbed was only 3360 calories; and this would seem to indicate that, when an equilibrium was established, the whole of the sulphuric acid had not been deprived of its sodium, but that $\frac{3360}{3900}$ of the sodium only had been transferred to the hydrochloric acid. However, it was found necessary to correct this result, as it was found that the freed sulphuric acid interacted with a portion of the residual sodium sulphate, forming sodium hydrogen sulphate. By estimating the amount of acid sulphate thus formed, and by a separate experiment finding how much heat was absorbed when the same quantity of acid sulphate was formed on adding dilute sulphuric acid to a dilute solution of sodium sulphate, it was found that this caused an absorption of 760 calories.

Hence, applying this correction for this secondary reaction, it was found that the heat absorbed owing to the replacement of the sulphuric acid in the sodium sulphate by the hydrochloric acid was 3360 – 760, or 2600 calories. If all the sulphuric acid had been expelled, this would have been 3900 calories, so that evidently only $\frac{2600}{3900}$ or $\frac{2}{3}$ of the sodium sulphate had been decomposed. Hence we conclude that in water solution, when equivalent quantities of sulphuric and hydrochloric acids react together on a base, the hydrochloric acid takes about two-thirds of the base and the sulphuric acid one-third.

We therefore regard hydrochloric acid as a stronger acid than sulphuric acid.

Thomsen showed that the same result was obtained by adding sulphuric acid to the equivalent quantity of sodium chloride solution. As far as could be judged by this method, the final result was the same. After carrying out a series of experiments with various acids, Thomsen constructed a table of what he called the avidities of the acids for a base in which the avidity of hydrochloric acid was taken as a standard and made equal to 100. The following are some of the figures taken from Thomsen's table:—

Acid.	Avidity.	Acid.	Avidity.
Hydrochloric	100	Hydrofluoric	5
Nitric	100	Tartaric	5
Hydrobromic	89	Citric	5
Hydriodic	70	Acetic	3
Sulphuric	49	Boric	1
Orthophosphoric	25	Silicic	0·+
Oxalic	24	Hydrocyanic	0·+

As Thomsen pointed out, these results are only approximate. They may be used to determine the distribution of soda between two acids if the base and the two acids are present in equivalent proportions. For example, suppose the two acids are hydrobromic and oxalic, the soda will be distributed between them in the ratio of 89 to 24; that is, the hydrobromic acid will take $\frac{89}{113}$ or 79·6 per cent. of the soda, and the oxalic acid the remainder, or 20·4 per cent. The student must guard against confusing these figures with the heats of neutralisation of the various acids.

Ostwald's Volume Method.—In 1877 Ostwald described his volume method—a method by means of which greater accuracy may be obtained than by Thomsen's method. He prepared solutions of such strength that one gram equivalent of base acid or salt was contained in one kilogram of solution. He then found the specific volumes of these solutions. He found that one kilogram of potassium hydroxide solution measured approximately 950 c.c., while the same weight of nitric acid measured approximately 966 c.c. On mixing these two solutions he found that the resulting volume was not the sum of the two, but 20 c.c. more.

In other cases similar changes were noted; and by using the results in a somewhat similar manner to that employed by Thomsen for his results, a table of avidities may be constructed in which we find that the relative order of the acids is the same, but some of the actual values obtained differ somewhat from Thomsen's. This, however, is not surprising, considering the errors which are liable to occur in thermo-chemical measurements.

In 1878 Ostwald conducted a long series of experiments with a large number of acids and the bases potash, soda, and ammonia, and from his results he came to the conclusion that with monobasic acids the ratio of distribution of the base between two acids was independent of the nature of the base, and depended on the acids only. With dibasic acids, like sulphuric acid, there was a considerable deviation from this rule, and this is probably due to the formation of acid salts and errors arising from the complications thus introduced.

Sugar Inversion Method.—When an aqueous solution of cane sugar is acidified by an acid, it is found that the sugar is gradually converted into two other sugars—dextrose and levulose—according to the equation

$$\underset{\text{(cane sugar)}}{C_{12}H_{22}O_{11}} + H_2O = \underset{\text{(dextrose)}}{C_6H_{12}O_6} + \underset{\text{(levulose)}}{C_6H_{12}O_6}.$$

These two sugars are represented by the same formula, but they are easily distinguished from each other when separate by their action on plane polarised light.

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Dextrose rotates the plane of polarisation to the right (hence its name), while levulose rotates it to the left. A certain quantity of levulose, however, will rotate the plane of polarisation of light much more than the same quantity of dextrose under the same conditions will rotate it to the right. Hence a mixture of the two sugars in equal proportions would rotate the plane of rotation to the left, or would, as it is commonly expressed, be laevo-rotatory.

Now cane sugar (or sucrose) itself is dextro-rotatory. Hence when a solution of cane sugar is acted on by acid, the solution gradually changes from a dextro-rotatory one to a laevo-rotatory one.

Of course, when all the cane sugar has been changed (or inverted, as we call it) the action ceases, and no further change in the rotation is observed.

Now the process of inversion is a slow one, and the rate of change can be found by means of a polariscope.

The results show that the rate at which the inversion proceeds depends upon the acid employed and upon its concentration, as well as upon the concentration of the sucrose solution. The strong mineral acids cause the inversion to take place much more rapidly than the weaker organic acids, and it has been found possible to obtain very good determinations of the relative strengths of acids by observing the rates at which the inversion is affected by the various acids.

(*To be Continued.*)

PHYSIOGRAPHY.

(STAGES 2 AND 3.)

SPECTROSCOPY—(*Continued from p.* 591).

WE have seen that glass has a different index of refraction for each different kind of light, and, if we have the glass in the form of a prism, we have seen how to measure the various indices by means of the spectrometer. We are now in a position to study the various types of spectra. If we place a white gas flame near the slit of the spectrometer we get a continuous spectrum. The same is true if we employ a solid which is giving out white light (say a piece of platinum wire kept at a white heat by an electric current). In general we find that we get a continuous spectrum from a solid or a liquid if it is made sufficiently hot, or even from a very dense gas under the same conditions. In the case of a coal-gas flame, or lamp, or candle flame, the luminosity seems to be largely due to the presence of heavy hydro-carbons, and even of carbon particles in the flame. If the gas is more completely burned, as in the case of the Bunsen-burner flame, the luminosity disappears and so does the spectrum. If now we take a volatile salt of a metal such as calcium chloride, and volatilise it in the Bunsen flame before the spectrometer slit, a bright line spectrum is produced; that is, we get a spectrum in which we have bright lines separated by dark spaces. Sometimes some of the lines are not sharply defined, but are drawn out into bands which gradually fade away on one or both sides. In some cases we may place the metal itself, instead of one of its salts, in the flame with a similar result if the flame is hot enough to volatilise the metal. The spectrum is in this case due to the incandescence of the vapour of the metal. Some metals, such as iron and copper, which are not readily volatilised, require a higher temperature before they will give a good spectrum.

These substances, however, can be made to give a good spectrum if sparks from an induction coil are caused to pass between poles composed of the metals. They then give bright line spectra like the other metals.

Gases, such as hydrogen, oxygen, and nitrogen, can also be caused to give bright line spectra by placing them in glass tubes into which platinum terminals have been fused, and passing sparks between the terminals.

The pressure of the gas in the tube is usually made low before the tube is sealed up. The discharge from the induction coil passing through the gas raises it to incandescence. Various temperatures can be obtained by sparking under different conditions, but we find that under no conditions is the same spectrum given by two different elements. Hence the various spectra can be utilised for determining the elements present in a body. It is quite true that in some cases it is not a very simple matter to determine spectroscopically the elements present in a body; but, when proper methods are adopted, this can always be done.

In addition to the bright line spectra already dealt with there is another very important class of spectra known as absorption spectra. These are of very great importance in connection with the spectroscopic examination of the stars. Hence it is necessary that we should try to understand how they may be produced. To help us let us take an illustration from a well-known experiment in sound. Take two tuning-forks of the same pitch, and mount them on suitable resonance boxes. Place them a little distance apart on a table, and set one of them vibrating vigorously. In a few seconds stop it vibrating and it will be found that the other fork is vibrating. A fork of different pitch would not in the same way cause the second fork to vibrate. Generally speaking (neglecting overtones, &c.), a tuning-fork can take up only one rate of vibration. If a train of waves of the same rate fall upon it, it responds and is set swinging, and its amplitude gradually increases just in the same way as a person on a swing gets up a considerable amplitude due to another person intermittently pushing the swing at the right time. If the pushes come at the wrong time no considerable amplitude is attained. The one fork resounds to the other, and we speak of this as a case of resonance or sympathetic vibration. The energy of the one fork is taken up by the other, and in this sense it is temporarily absorbed. It is true the energy is given out again, but the intensity of the sound given by the second fork is not so great as that given by the first.

In the case of light, if by means of a lens we focus the light from a source at a very high temperature, and giving a white light, and allow the light before reaching the slit to pass through a Bunsen flame containing sodium, it will be found that the otherwise continuous spectrum is crossed by a dark band in the position usually occupied by the yellow sodium line. This line is, however, dark only by comparison. It is not absolutely dark. The vibrations of the same pitch as those given out by the sodium flame are absorbed by the sodium flame before the light reaches the spectrometer. The sodium flame of course sends light to the slit, but its intensity is not nearly so great as that of the rest, and in consequence by comparison it appears dark. This apparently dark line in the spectrum is called an absorption line, and a spectrum containing absorption lines is called an absorption spectrum. Absorption spectra can be produced by passing a white light through coloured liquid solutions, through coloured transparent solids, or through gases. The dark lines found in the absorption spectrum of a gas are just those lines which the gas would produce as bright lines if it were raised to incandescence, and hence they will serve for the identification of a gas in the same way as bright lines. This is of great importance, as we find there are many absorption lines in the spectrum of the sun and the spectra of many of the stars.

By means of these absorption lines we are therefore enabled to prove the presence of certain elements in these bodies.

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Simple Harmonic Motion.—Before proceeding to show the application of the formulæ to a few typical examples it may be necessary briefly to recapitulate some of the more important sections already referred to.

Thus, if a point P is moving with uniform angular velocity ω in a circle of radius r (usually referred to as the auxiliary circle), the projection M of P on a diameter of the circle has a motion known as simple harmonic motion, and the acceleration of M is equal to $\omega^2 x$—where x denotes the distance of M from the centre of the circle,—hence the acceleration of M is proportional to its distance from the middle of its path; obviously the acceleration is a maximum when $x = r$, and is a minimum, or zero, when $x = o$.

Dividing the acceleration of M by its displacement, we obtain the fundamental relation—acceleration ÷ displacement = constant $= \omega^2$.

Also $\omega^2 = 2^2\pi^2 n^2$ or $\frac{2^2\pi^2}{t^2}$ where n denotes the number of oscillations per second and t the time of one oscillation.

Professor E. E. Denney.

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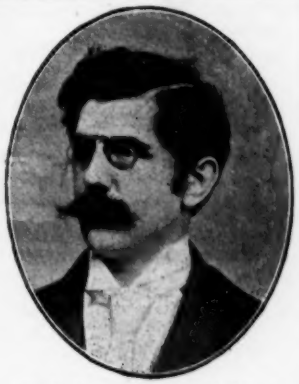

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Thus, for linear motion, we obtain for the periodic time the relation—

$$t = 2\pi\sqrt{\frac{\text{displacement}}{\text{acceleration}}}.$$

Similarly for angular motion—

$$t = 2\pi\sqrt{\frac{\text{angular displacement}}{\text{angular acceleration}}}.$$

Examples dealing with the former have already been dealt with, and it may be advisable to consider a few typical examples of the latter.

Ex. 1. A uniform rod is supported horizontally by two equal vertical threads fastened to two fixed points. The rod is then twisted through an angle θ (strictly θ is of course the angle between the projections of the rod in its two positions on a horizontal plane); the rod being still horizontal; find the moment of the couple which will keep the rod in its new position.

Show also that when θ is a small angle the moment equals $Wa^2\theta \div l$, where W and a are the weight and length of the rod and l the length of each thread. (B. E. 1898.)

Let τ denote the tension in each thread.

Then the vertical component of each thread, when the rod is twisted through an angle θ, is $2\tau\cos\beta$, where β is the inclination of each thread to the vertical; as the two threads support the weight W we find—

$$2\tau\cos\beta = W,$$

$$\therefore\ \tau = \frac{W}{2\cos\beta} \quad \ldots\ldots\ldots \quad (1.)$$

A horizontal or restoring couple $2\tau\sin\beta \times p$ (where p is the arm of the couple) must be applied to hold the rod twisted through an angle θ, also $p = \frac{a}{2}\cos\frac{\theta}{2}$,

$$\therefore\ \text{Restoring couple} = C = \tau a\sin\beta\cos\frac{\theta}{2}.$$

Substituting the value of τ from (1)—

$$C = \frac{Wa\sin\beta\cos\frac{\theta}{2}}{2\cos\beta}$$

$$= Wa\tan\beta\cos\frac{\theta}{2} \quad \ldots\ldots \quad (2.)$$

Now $\tan\beta$ is formed by the base and perpendicular of a right-angled triangle, the hypotenuse being l and the base $a\sin\frac{\theta}{2}$,

$\therefore$ the perpendicular $= \sqrt{l^2 - a^2\sin^2\frac{\theta}{2}}$

$$\text{or } \tan\beta = \frac{a\sin\frac{\theta}{2}}{\sqrt{l^2 - a^2\sin^2\frac{\theta}{2}}}.$$

Substituting this value in (2) we obtain—

$$C = \frac{Wa^2\sin\frac{\theta}{2}\cos\frac{\theta}{2}}{2\sqrt{l^2 - a^2\sin^2\frac{\theta}{2}}}$$

$$= \frac{Wa^2\sin\theta}{\sqrt{l^2 - a^2\sin^2\frac{\theta}{2}}}.$$

As the angle θ is small, $\sin^2\frac{\theta}{2}$ is negligible.

Also $\sin\theta = \theta$,

$$\therefore\ C = Wa^2\theta \div l.$$

Ex. 2. A circular ring of radius a and weight W is suspended in a horizontal position by three vertical threads each of length l attached to points on its circumference; prove that in order to hold the ring horizontal and twisted through an angle θ a horizontal couple must be applied to it equal to $\dfrac{Wa^2\sin\theta}{\left(l^2 - 4a^2\sin^2\frac{\theta}{2}\right)^{\frac{1}{2}}}$.

Prove that the small angular oscillations of the ring are simple harmonic, and that their periodic time is the same as that of a simple pendulum of length l. (Inter. Science, 1900.)

With the preceding notation we obtain—

$$3\tau\cos\beta = W$$

$$\text{or } \tau = \frac{W}{3\cos\beta} \quad \ldots\ldots\ldots \quad (1.)$$

When the ring is twisted through an angle the arm of the couple is $a\cos\frac{\theta}{2}$.

Hence a couple $3\tau\sin\beta \times a\cos\frac{\theta}{2}$ must be applied to hold the ring twisted at an angle θ.

Substituting the value of τ from (1) we obtain—

$$C = Wa\tan\beta\cos\frac{\theta}{2} \quad \ldots\ldots \quad (2.)$$

As in the preceding case—

$$\tan\beta = \frac{2a\sin\frac{\theta}{2}}{\sqrt{l^2 - 4a^2\sin^2\frac{\theta}{2}}}.$$

Substituting this value in (2)—

$$C = \frac{2Wa^2\sin\frac{\theta}{2}\cos\frac{\theta}{2}}{\sqrt{l^2 - 4a^2\sin^2\frac{\theta}{2}}}$$

$$= \frac{Wa^2\sin\theta}{\left(l^2 - 4a^2\sin^2\frac{\theta}{2}\right)^{\frac{1}{2}}} \quad \ldots\ldots\ldots \quad (3.)$$

When θ is small, $\sin^2\frac{\theta}{2}$ may be neglected and $\sin\theta = \theta$,

$$\therefore\ C = \frac{Wa^2\theta}{l}.$$

As C is proportional to θ, the angular displacement, the small oscillations will be simple harmonic.

From the relation $t = 2\pi\sqrt{\dfrac{\text{angular displacement}}{\text{angular acceleration}}}$,

we obtain $t = 2\pi\sqrt{\dfrac{\theta}{C \div I}}$,

where I denotes the moment of inertia of the disc $= \dfrac{Wa^2}{g}$.

Substituting this value—

$$t = 2\pi\sqrt{\frac{\theta}{\frac{Wa^2}{l} \div \frac{Wa^2}{g}}} = 2\pi\sqrt{\frac{l}{g}}.$$

Hence the periodic time of small oscillations of the ring is the same as that of a simple pendulum of length l.

Ex. 3. Investigate the harmonic vibration of the balance wheel of a chronometer moment of inertia I (lb ft²) and prove that if the wheel swings through N° from rest in τ seconds, the maximum couple exerted by the balance spring must be—

$$\frac{\pi^2 IN}{180g\tau^2} \text{ (lb ft)}.$$

(B. Science 1902.)

Gardening Handbooks.—Our country friends will be glad to know that the Agricultural and Horticultural Association is about to issue a series of practical penny handbooks. We have received a copy of the first, which deals with the culture of sweet peas, and can heartily recommend it to all interested in these charming favourites.

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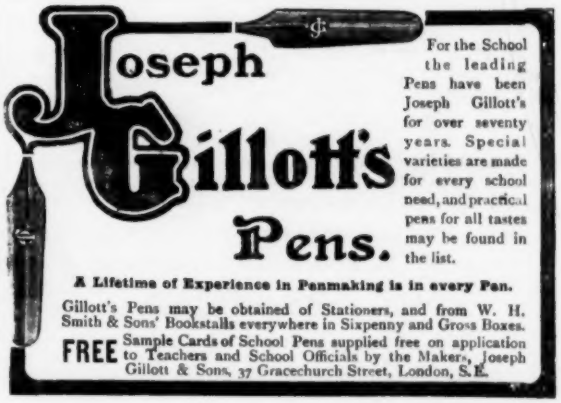

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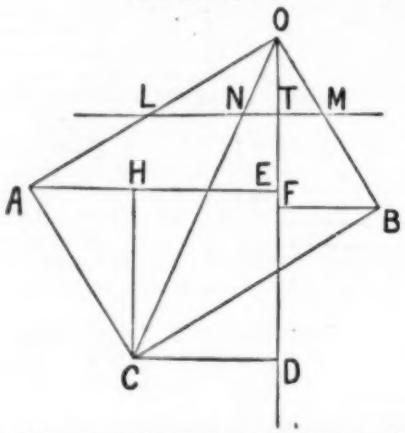
Answer.—Forces P, Q, whose resultant is R, act at a point O, and a line is drawn meeting their directions in L, M, N; show that

$$\frac{P}{OL}+\frac{Q}{OM}=\frac{R}{ON}.$$



Let OA, OB represent the given forces P, Q in magnitude and direction, and let OC represent the resultant R. Then by the parallelogram of forces OACB must be a parallelogram. Let LMN be any straight line meeting OA, OB, OC, or these lines produced in L, M, N. Draw OT perpendicular to LM, and let AE, BF, CD each parallel to LM intersect OT, or OT produced, in E, F, D. Draw CH parallel to OT, and let it intersect AE in H.

Then from similar triangles we have

$$\frac{OA}{OL}=\frac{OE}{OT};\ \frac{OB}{OM}=\frac{OF}{OT}.$$

$$\therefore\ \frac{OA}{OL}+\frac{OB}{OM}=\frac{OE+OF}{OT}.$$

But $OF=CH=ED$.

$$\therefore\ \frac{OA}{OL}+\frac{OB}{OM}=\frac{OE+ED}{OT}=\frac{OD}{OT}.$$

But $$\frac{OD}{OT}=\frac{OC}{ON}.$$

$$\therefore\ \frac{OA}{OL}+\frac{OB}{OM}=\frac{OC}{ON}.$$

Hence $$\frac{P}{OL}+\frac{Q}{OM}=\frac{R}{ON}.$$

P. F. M.—(*a*) Find four values of x which satisfy $2\cos x=1$; and (*b*) find a general expression for all the values of x which satisfy the following equation—

$$3\tan^2 x=2(\cos x-\sec x)(2\cos x-3\sec x).$$

(*a*) We have $\cos X=\frac{1}{2}$.

Now, the least positive angle which has its cosine equal to $\frac{1}{2}$ is 60°; the next least is 360° − 60°, or 300°; the third is 360° + 60°, or 420°; and the fourth is 720° − 60°, or 660°.

(*b*) $$3\tan^2 x=2(\cos x-\sec x)(2\cos x-3\sec x).$$

$$\therefore\ 3\frac{\sin^2 x}{\cos^2 x}=2\left(\cos x-\frac{1}{\cos x}\right)\left(2\cos x-\frac{3}{\cos x}\right).$$

$$\therefore\ 3\frac{\sin^2 x}{\cos^2 x}=2\frac{(\cos^2 x-1)(2\cos^2 x-3)}{\cos^2 x}.$$

$$\therefore\ 3\sin^2 x=2(\cos^2 x-1)(2\cos^2 x-3).$$

$$\therefore\ 3(1-\cos^2 x)=2(\cos^2 x-1)(2\cos^2 x-3).$$

Denoting $\cos^2 x$ by z, the last equation becomes

$$3(1-z)=2(z-1)(2z-3).$$

$$\therefore\ 3-3z=4z^2-10z+6.$$

$$\therefore\ 4z^2-7z+3=0.$$

$$\therefore\ z=\frac{7\pm\sqrt{\{49-48\}}}{8}=1,\text{ or }\tfrac{3}{4}.$$

$$\therefore\ \cos^2 x=1\text{ or }\tfrac{3}{4}.$$

$$\therefore\ \cos x=\pm 1\text{ or }\pm\frac{\sqrt{3}}{2}.$$

Now all the angles which have ± 1 for cosine are included in the formula $n180°$, where n may be zero or any integer positive or negative.

Again, all the angles which have $\pm\frac{\sqrt{3}}{2}$ for cosine are included in the formula $n180°\pm 30°$, where n is zero or any integer positive or negative.

J.B.H.—Prove that

$$\frac{2}{\lfloor 3}+\frac{4}{\lfloor 5}+\frac{6}{\lfloor 7}+\ldots=\frac{1}{e}.$$

By the exponential theorem we have

$$e^x=1+\frac{x}{\lfloor 1}+\frac{x^2}{\lfloor 2}+\frac{x^3}{\lfloor 3}+\ldots$$

for all values of x.

Hence $$e^{-1}=1-\frac{1}{\lfloor 1}+\frac{1}{\lfloor 2}-\frac{1}{\lfloor 3}+\frac{1}{\lfloor 4}-\frac{1}{\lfloor 5}+\ldots$$

But $e^{-1}=\frac{1}{e}$; therefore

$$\frac{1}{e}=(1-1)+\left(\frac{1}{\lfloor 2}-\frac{1}{\lfloor 3}\right)+\left(\frac{1}{\lfloor 4}-\frac{1}{\lfloor 5}\right)+\left(\frac{1}{\lfloor 6}-\frac{1}{\lfloor 7}\right)+\ldots$$

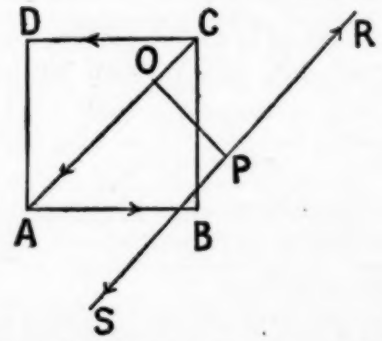
$$\therefore\ \frac{1}{e}=\frac{3-1}{\lfloor 3}+\frac{5-1}{\lfloor 5}+\frac{7-1}{\lfloor 7}+\ldots$$

$$\therefore\ \frac{1}{e}=\frac{2}{\lfloor 3}+\frac{4}{\lfloor 5}+\frac{6}{\lfloor 7}+\ldots$$

(What you give hardly amounts to a proof; it is rather an approximate verification.)

H.H.—Draw a square ABCD and its diagonal AC. Two forces of 10 units act from A to B and from C to D respectively, forming a couple; a third force of 15 units acts from C to A. Find their resultant, and show in a diagram exactly how it acts.

(Tutorial Statics.)



Take any point O in AC and draw OP perpendicular to AC, and such that 15 OP = 10 AD.

At P place two equal and opposite forces PR, PS parallel to AC, and each equal to a force of 15 units.

The force PR and the given force along CA form a couple,

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15 OP, which will balance the given couple 10 AD. There remains the force PS of 15 units, acting along a line parallel to AC and at a perpendicular distance OP from AC, such that 15 OP = 10 AD, or OP = $\frac{2}{3}$ AD.

Sinuc.—If α and β be the roots of

$$x^2 - 5x + a = 0,$$

find the equation whose roots are $(\alpha+2)^2$ and $(\beta+2)^2$.

The roots of $x^2 - 5x + a = 0$ are given by the formula

$$x = \frac{5 \pm \sqrt{(25 - 4a)}}{2}.$$

Hence we may put $\alpha = \frac{5 + \sqrt{(25 - 4a)}}{2}$,

and $\beta = \frac{5 - \sqrt{(25 - 4a)}}{2}$.

We have then $\alpha + 2 = \frac{9 + \sqrt{25 - 4a}}{2}$,

and $\beta + 2 = \frac{9 - \sqrt{25 - 4a}}{2}$.

Therefore

$$(\alpha+2)^2 = \frac{81 + 25 - 4a + 18\sqrt{25 - 4a}}{4} = \frac{53 - 2a + 9\sqrt{25 - 4a}}{2},$$

and $(\beta+2)^2 = \frac{53 - 2a - 9\sqrt{25 - 4a}}{2}$.

Now the equation whose roots are $(\alpha+2)^2$ and $(\beta+2)^2$, may be written

$$\{x - (\alpha+2)^2\}\{x - (\beta+2)^2\} = 0,$$

or $\left\{x - \frac{(53 - 2a + 9\sqrt{25 - 4a})}{2}\right\}\left\{x - \frac{(53 - 2a - 9\sqrt{25 - 4a})}{2}\right\} = 0,$

or $(2x - 53 + 2a - 9\sqrt{25 - 4a})(2x - 53 + 2a + 9\sqrt{25 - 4a}) = 0,$

or $(2x - 53 + 2a)^2 - 81(25 - 4a) = 0,$

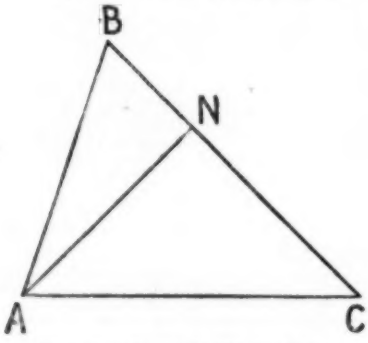
or $4x^2 + 2809 + 4a^2 - 212x + 8ax - 212a - 2025 + 324a = 0,$

or $x^2 + (2a - 53)x + (a + 14)^2 = 0.$

Puzzled.—If AN is drawn at right angles to BC and the triangle such that N is in the side BC and that CN equals twice BN, show that

(*a*) Sin B cos C = 2 sin C cos B.

(*b*) $9b^2 + 9c^2 - 18bc \cos (B - C) = a^2$.



(*a*) Since AN is perpendicular to BC, we have

$$\sin B = \frac{AN}{AB} \text{ and } \cos C = \frac{NC}{CA}.$$

Hence $\sin B \cos C = \frac{AN}{AB} \cdot \frac{NC}{CA} = \frac{AN}{CA} \cdot \frac{NC}{AB} = \frac{AN}{CA} \cdot \frac{2NB}{AB}$.

But $\frac{AN}{CA} = \sin C$, and $\frac{NB}{AB} = \cos B$;

therefore $\sin B \cos C = 2 \sin C \cos B$.

(*b*) In NC take $NB_1 = NB$. Then since NC equals twice NB we have $BN = NB_1 = B_1C$.

Hence $B_1C = \frac{BC}{3} = \frac{a}{3}$.

Now $(BC_1)^2 = (B_1A)^2 + (AC)^2 - 2(B_1A)(AC)\cos B_1AC$.

But $BA_1 = BA$, and $\angle B_1AC = \angle AB_1C - \angle ACB$.

Therefore $\left(\frac{a}{3}\right)^2 = c^2 + b^2 - 2cb \cos (B - C)$.

Hence $9b^2 + 9c^2 - 18bc \cos (B - C) = a^2$.

Scamp.—Show that

$${}^{n+1}C_r = {}^nC_r + {}^nC_{r-1}$$

$${}^{n+1}C_r = \frac{(\overline{n+1})(\overline{n+1-1})(\overline{n+1-2}) \ldots (\overline{n+1-r+1})}{\underline{|r}}$$

$$= \frac{(n+1)(n)(n-1) \ldots (n-r+2)}{\underline{|r}}$$

$${}^nC_r = \frac{n(n-1)(n-2) \ldots (n-r+1)}{\underline{|r}}$$

$${}^nC_{r-1} = \frac{n(n-1)(n-2) \ldots (n-\overline{r-1}+1)}{\underline{|\overline{r-1}}}$$

$$= \frac{n(n-1)(n-2) \ldots (n-r+2)}{\underline{|r-1}} \cdot \frac{r}{r}$$

$$= \frac{n(n-1)(n-2) \ldots (n-r+2) \cdot r}{\underline{|r}}$$

Hence ${}^nC_r + {}^nC_{r-1}$

$$= \frac{n(n-1)(n-2) \ldots (n-r+2)\{\overline{n-r+1} + r\}}{\underline{|r}}$$

$$= \frac{(n+1)(n)(n-1)(n-2) \ldots (n-r+2)}{\underline{|r}}$$

But we have shown that ${}^{n+1}C_r$ is equal to the last expression. Therefore ${}^{n+1}C_r = {}^nC_r + {}^nC_{r-1}$.

E.S.S.—What volume of a decinormal solution of KOH would be required exactly to neutralise 100 grams of a 5 per cent. solution of H_2SO_4?

A decinormal solution of KOH contains $\frac{39 + 16 + 1}{10}$ grams of KOH in one litre; that is, 5·6 grams of KOH per litre. 100 grams of a 5 per cent. solution of H_2SO_4 contains 5 grams of H_2SO_4.

Now from the equation

$$\underbrace{H_2SO_4}_{98} + 2\underbrace{KOH}_{2\,(56)} = K_2SO_4 + 2H_2O$$

we find that 5·6 grams of KOH will exactly neutralise 4·9 grams of H_2SO_4. Hence we should require $\frac{5}{4{\cdot}9} \times 5{\cdot}6$ grams of KOH exactly to neutralise 5 grams of H_2SO_4. Therefore we should here require $\frac{5}{4{\cdot}9}$ litres of a decinormal solution of KOH exactly to neutralise 100 grams of a 5 per cent. solution of H_2SO_4.

Duntaxat.—The part of the parabola $y^2 = 4ax$ cut off by the latus rectum revolves about the tangent at the vertex. Find the convex surface and volume of the reel thus generated.

(Edwards' *Integral Calculus.*)

Here we have $\frac{dy}{dx} = \sqrt{\frac{a}{x}}$, and $\frac{ds}{dx} = \sqrt{1 + \frac{a}{x}}$.

(See Edwards' *Integral Calculus*, § 157, Ex. 1.)

The area of the convex surface is given by

$$2\pi \int_0^a x \frac{ds}{dx} \cdot dx\}.$$

Therefore surface $= 4\pi \int_0^a x\sqrt{\frac{x+a}{x}} \cdot dx = 4\pi \int_0^a \sqrt{x^2 + ax} \cdot dx$

$$= 4\pi \int_0^a \sqrt{\left(x + \frac{a}{2}\right)^2 - \frac{a^2}{4}} \cdot dx$$

$$= 4\pi \left[\left(x + \frac{a}{2}\right)\frac{\sqrt{x^2 + ax}}{2} - \frac{a^2}{8} \log \frac{x + \frac{a}{2} + \sqrt{x^2 + ax}}{\frac{a}{2}}\right]_0^a$$

(See Edwards' *Integral Calculus*, § 41.)

Hence Surface $= 4\pi \left\{\frac{3a}{2} \cdot \frac{\sqrt{2}a}{2} - \frac{a^2}{8} \log (3 + 2\sqrt{2})\right\}$

$$= \pi a^2\{3\sqrt{2} - \tfrac{1}{2} \log (3 + 2\sqrt{2})\}$$

$$= \pi a^2\{3\sqrt{2} - \log (3 + 2\sqrt{2})^{\frac{1}{2}}\}$$

$$= \pi a^2\{3\sqrt{2} - \log (\sqrt{2} + 1)\}.$$

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$$= 2\pi\left(2 - \frac{2}{5}\right)a^3 = \frac{16}{5}\pi a^3.$$

Dunelmian.—The electrical resistance of a given material varies directly as the length and inversely as the square of the diameter. Find the length and diameter of a wire which is to have three-fourths of the electrical resistance and one-third of the weight of a wire of the same material 50 feet long and 0·03 inches diameter.

Let R denote the resistance of the wire, whose length is 50 feet and diameter 0·03 inches. Then $R = k\frac{50}{(0{\cdot}03)^2}$ where k is some constant. Let l be the length in feet and d the diameter in inches of the other wire. Then by the question we have

$$k\frac{l}{d^2} = \frac{3}{4}k\frac{50}{(0{\cdot}03)^2}. \quad \text{Therefore } \frac{l}{d^2} = \frac{3\times 50}{4\times(0{\cdot}03)^2} \quad . \ . \ . \quad \text{(i.)}$$

Again the weight of either wire is proportional to the product of the length into the square of the diameter.

Hence the weight of the first wire is $\lambda 50\times(0{\cdot}03)^2$, and the weight of the second wire is $\lambda l d^2$, where λ is some constant. Then by the question we have $3(\lambda l d^2) = \lambda 50\times(0{\cdot}03)^2$. Therefore $3ld^2 = 50\times(0{\cdot}03)^2$.

But from (i.) we have $d^2 = \frac{4\times(0{\cdot}03)^2}{3\times 50}\,.\,l$.

Therefore $$3l\frac{4\times(0{\cdot}03)^2}{3\times 50}l = 50\times(0{\cdot}03)^2.$$

$$\text{Hence } l^2 = \frac{50\times 50}{4}. \quad \text{Therefore } l = 25.$$

But $$d^2 = \frac{4\times(0{\cdot}03)^2}{3\times 50}.l = \frac{4\times(0{\cdot}03)^2\times 25}{3\times 50} = \frac{4\times(0{\cdot}03)^2}{6}.$$

Therefore $$d = \frac{2\times 0{\cdot}03}{\sqrt{6}} = \frac{0{\cdot}03\sqrt{6}}{3} = 0{\cdot}01\sqrt{6}.$$

Hence the length of the second wire must be 25 feet and its diameter $0{\cdot}01\sqrt{6}$ inches.

Bike.—A circle rolls with uniform velocity along a straight line; obtain the co-ordinates of a given point on its circumference at time t in the form $x = a(nt - \sin nt)$, $y = a(1 - \cos nt)$, and hence find the length of the path described by the point during one revolution of the circle. (B.Sc., London, 1904.)

Here a is the radius of the given circle and $nt = \theta$, *i.e.* the angle through which the circle has rolled in time t, starting from the position in which the given point in the circumference is upon the given straight line. We have therefore only to find the equation of the cycloid generated by the given point, referred to a cusp as origin; and then to determine the length of the arc of the cycloid between two consecutive cusps. This is given in any standard work on the calculus; see, for example, Williamson's *Differential Calculus*, §§ 272 and 276.

Hydro.—The sides of a rectangle are as $\pi : 4$, and semicircles are described on the longer sides as diameters. Prove that if the rectangle be immersed in water with a short side in the surface, the thrusts on the parts external to both semicircles will be together equal to that on the part common to both.

(Greaves' *Hydrostatics.*)

Let ABCD be the given rectangle, in which AB represents 4 and AD represents π units of length. Let the semicircles on AB, CD as diameters intersect in E, F.

The thrust of the water on ABCD $= AD.AB.\frac{AB}{2}\ g\ \rho$

$= \pi\,4 + 2\,g\,\rho = 8\,\pi\,g\,\rho$ where ρ is the density of water.

The thrust on the semicircle AKB $= \frac{1}{2}\pi\left(\frac{AB}{2}\right)^2\frac{AB}{2}\ g\ \rho$

$= \frac{1}{2}\pi\frac{AB^3}{4}g\,\rho = \frac{1}{2}\pi\frac{4^3}{8}g\,\rho = 4\,\pi\,g\,\rho.$

Similarly the thrust on the semicircle CHD $= 4\,\pi\,g\,\rho$.

Therefore the thrust on the area AEHFB + the thrust on the area DEKFC + twice the thrust on the area EHFKE $= 8\,\pi\,g\,\rho$ = the thrust on the area ABCD = the thrust on the area AEHFB + the thrust on the area DEKFC + the thrust on the area EHFKE + the thrust on the area AED + the thrust on the area BFC.

Hence the thrust on the area EHFKE = the thrust on the area AED together with the thrust on the area BFC.

W.H.W.—A small air-bubble in a sphere of glass 4 inches in diameter appears, when looked at so that the bubble and the centre of the sphere are in a line with the eye, to be one inch from the surface. What is its true distance from the surface?

In any standard work on *Geometrical Optics* it is shown that if μ be the index of refraction from glass to air, u the true distance of the object from the surface of the sphere, and v its apparent distance from the same surface, then

$$\frac{\mu}{v} - \frac{1}{u} = \frac{\mu - 1}{r}$$

where r is the radius of the sphere.

(See, for example, R. W. Stewart's *Text-Book of Light*, § 46.)

Here $\mu = \frac{3}{2}$, $v = 1$ inch, and $r = 2$ inches.

Hence $$\frac{\frac{3}{2}}{1} - \frac{1}{u} = \frac{\frac{3}{2} - 1}{2}.$$

Therefore $$\frac{1}{u} = \frac{2}{3} + \frac{1}{2},$$

or $$\frac{1}{u} = \frac{4}{6} + \frac{1}{6} = \frac{5}{6}.$$

Therefore $$u = \frac{6}{5} = 1{\cdot}2 \text{ inches.}$$

Mat.—A square conducting frame cut through at one place rotates in the earth's magnetic field about a vertical axis passing through the middle points of opposite sides. Describe the variation in e.m.f. between the two sides of the break which consequently occurs, and calculate its maximum amount when there are 120 revolutions per minute, if the edge of the square is 25 cm., and the intensity of the earth's horizontal force is 0·18.

(Inter. Science, London, 1904.)

The number, N, of lines of force passing through the frame at time t is

$$N = AB\cos pt,$$

where A is the area of the frame, B the intensity of the field, p the angular velocity of the frame, and t is measured from an instant when the frame is normal to the lines of force.

The e.m.f. induced in the moving circuit is therefore given by

$$e = AB\,p\sin pt,$$

which is the rate of change of the magnetic flux through the circuit.

A $= 25\times 25 = 625$ sq. centimetres.

B $= 0{\cdot}18$. Therefore AB $= 625\times 0{\cdot}18 = 112{\cdot}5$ lines of force.

Since $e = AB\,p\sin pt$, $\therefore\ e_{max.} = AB\,p$.

But p is an angular velocity of 120 revolutions per minute, that is, $4\,\pi$ radians per second.

$$\therefore\ e_{max.} = 112{\cdot}5\times 4\,\pi \text{ C.G.S. units.}$$

$$= 450\,\pi\,10^{-8} \text{ volts.}$$

Lew.—How is the property whereby a solid conducts heat measured? Suppose 10 cm. of ice to have already formed on a pond, and that the air is at $-5°$ C, how long approximately will it take for the next mm. to form?

(Inter. Science, London, 1904.)

The first part is given in any standard text-book on *Heat*. (See, for example, R. W. Stewart's *Text-Book of Heat*, § 84.) If k denotes the thermal conductivity of a slab of the substance, then the difference of temperatures of the opposite faces being θ degrees, we have $H = \frac{k\,A\theta t}{x}$, where H is the quantity of heat which passes in time t, A is the area and x the thickness of the slab.

Specific heat of water = 80.

Volume of slab of ice to be formed on 1 sq. cm. $= 1\times 1\times 0{\cdot}1$ cubic cm. $= 0{\cdot}1$ cubic cm.

Mass of ice to be formed $= 0{\cdot}09$ grammes.

Heat to be conducted away from the water per sq. cm. $= 0{\cdot}09\times 80 = 7{\cdot}2$ units of heat.

Specific conductivity of ice $= 0{\cdot}0057$ C.G.S. units.

$$\therefore\ 7{\cdot}2 = \frac{0{\cdot}0057\times 5\,t}{10}.$$

$$\therefore\ t = \frac{72}{0{\cdot}0285} \text{ seconds.}$$

$$\therefore\ t = 42 \text{ minutes, nearly.}$$

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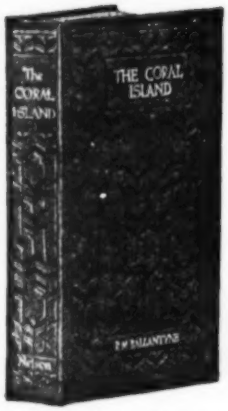

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